Regulatory Changes and the Cost of Capital for Banks

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Abstract

We estimate the cost of capital for the banking industry and find that while the cost of capital soared for banks in the financial crisis, after the passage of the Dodd-Frank Act, the value-weighted cost of capital for banks fell differentially more than did the cost of capital for non-banks. The very largest banks drive the decline in expected returns. Over a longer time horizon, the cost of capital for banks may be differentially higher than non-banks relative to the time period before the Graham-Leach-Bliley Act was passed, although in some measures the difference is negative and or cannot be distinguished from zero. We find some evidence that stress testing has lowered the cost of capital for the largest stress tested banks, although not for those added more recently to stress testing.

Keywords: Cost of Capital, Beta, Bank Regulation, Dodd Frank, Banks

JEL Classification: G12, G21, G28

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1 Introduction

The cost of capital reflects the perceived risk of a company's equity to investors. Managers seek to earn or outperform their cost of capital. For banks, the cost of capital drives lending amounts, borrowing rates, and thus real economic activity.[1] But what is the cost of capital for banks and how has it changed with changes in regulation? We find that, in net, regulations following the financial crisis have lowered significantly the cost of capital for banks relative to the all-time highs experienced during the crisis. Looking over a longer horizon and accounting for changes in the risk-free rate, banks' cost of capital appears to have reverted to levels higher than those experienced before the deregulation of the 2000s. However, some of this increase is explained by the changes to bank business models relative to twenty years ago such as the decreased share of loans in banks' asset mix. The difference between the post-Dodd Frank period and the pre-deregulation period depends on the cost of capital measure and specification, and by some measures the cost of capital today is lower or cannot be statistically distinguished from zero.

One contribution of this paper is to understand the effects of regulation on banks through the lens of stock prices. We do this by comparing changes in the cost of capital for banks and non-banks, separating the last twenty years by key dates in bank regulation including the: Graham-Leach-Bliley Act (November 1999), Financial Crisis (January 2007), Supervisory Capital Assessment Program (May 2009), and Dodd-Frank Act (July 2010). Since the passage of the Dodd-Frank Act (DFA), the value-weighted cost of capital has averaged 11% for banks and 8% for non-banks.[2] For all firms, including banks, average levels of expected returns on equity and weighted average costs of capital are much lower than in the late 1990s, primarily reflecting the 4.5% decline in the risk-free rate. Controlling for changes in the risk-free rate, we estimate that on a value-weighted basis, the cost of equity for banks is statistically significantly lower in the current period relative to the high levels reached in the period immediately after the financial crisis but before the passage of the DFA. At the same time, many measures of expected returns for banks are higher now than they were in the period before the passage of the Graham-Leach-Bliley Act (GLB) in 1999, which repealed provisions from the Glass-Steagall Act of 1933 that separated investment banking and commercial banking activities. Over the last twenty years, the cost of capital for banks was lowest in the period between the passage of GLB and the run-up to the financial crisis, and

[1] Cummins et al. (1994), Philippon (2009), Gilchrist et al. (2013), and Brunnermeier and Sannikov (2014).

[2] Throughout the paper we refer to expected equity returns as the cost of capital, although we we also explore other cost of capital metrics such as the weighted average cost of capital (WACC). Mechanically, the value-weighted sum of bank and non-bank stock returns is the aggregate stock market return whose cost of capital is equal to the risk-free rate plus the equity risk premium.

highest following the onset of the crisis through the passage of the DFA.

In order to separate the effects of regulation from market wide changes in expected returns, we compare the change in the cost of capital for banks and non-bank firms over time. This difference-in-differences approach allows us to distinguish between differences in expected returns for investors that affect all companies, such as changes to the risk-free rate, and differences in regulation that affect only banks. For banks, cost of capital estimates spiked in the period following the financial crisis, averaging more than 15% on a value-weighted basis, a spike not experienced by non-banks (value weighted). Results of the differences-in-differences analysis are similar, because there are no statistically significant differences for non-banks cost of capital around these breaks in bank regulation once the change in the risk-free rate is differenced out. Comparing the period following the passage of the Dodd-Frank Act to the immediate prior time period, the cost of capital fell by approximately 4.5% more for banks relative to other firms, a difference that is economically and statistically significant. However, when comparing the post Dodd-Frank period to the period before Glass-Steagall was repealed, the cost of capital for non-banks has fallen by 1% to 2% more than that of banks. This suggests that while post-crisis bank regulation may have reduced expected returns from post-crisis highs, that the cost of capital for banks is higher than it was twenty years ago.

To confirm that this first difference is capturing regulation, we do several additional analyses. First, the cost of capital for banks may change relative to non-banks for reasons other than regulation. For example, holding assets fixed, changes to the market perception of the systemic risk of financial intermediation related assets (asset betas) can change the cost of capital for banks. If investors revalue the riskiness of financial intermediation assets at the same time that bank regulations are changing, we may spuriously attribute changes in asset betas to regulation, or underestimate the impact of regulation. To account for this, we take two approaches. First, we compare banks to only non-bank financial intermediaries, whose systemic risk should change with that of banks. The results are similar – the cost of capital falls by more for banks than for non-bank financials after DFA, and remains higher than that of non-bank financials when comparing the current time period to the late 1990s. Since banks may respond differently to changes in rates, we also confirm that our results are robust to controlling for levels of interest rates and term spreads.

Second, since many recent financial regulatory reforms apply only to the largest banks, we ask if changes in the cost of capital for the very largest banks relative to smaller banks are different from changes in the cost of capital for the very largest non-banks and non-bank financials relative to smaller firms in the same industries. This analysis is particularly relevant to the analysis of changes around the passage of the Dodd Frank Act. Large banks are different from small banks on average, with a cost of capital that is 3% higher from 1996 to 2017. Large banks also drive the differential changes in the cost of capital relative to nonbanks, with the very largest banks exhibiting the largest increase in their cost of capital after the financial crisis as well as the largest decrease after DFA. In comparison to non-bank financials, however, the fall in the cost of capital for the largest banks is smaller after the financial crisis. Over a longer horizon that compares the current period to the pre-GLB period, the cost of capital for the largest firms relative to smaller firms has fallen by around 2% across industries with an additional decline of 1% to 2% for the largest banks relative to smaller banks, a result that is significant in several specifications.

Comparing the different regulatory time periods, the cost of capital fell the most for banks and non-bank financial intermediaries relative to other firms after the passage of the Graham-Leach-Bliley Act. This highlights the importance of the comparison period and the comparison set of companies in measuring changes in the cost of capital. For example, Sarin and Summers (2016) compare a pre-crisis period from 2002-2007 to a post-crisis period from 2010-2015 and find that the cost of capital has increased for banks. Their conclusions are driven, in part, by the fact that the comparison period from 2002-2007 is a time that coincides with unusually low expected returns for banks. However, this also points out some limitations of interpreting the cost of capital as a measure of systemic bank risk that would be important to policy makers – the exact years in which cost of capital estimates were unusually low were exactly the years in which ex-post realizations suggest that tail risk was growing in the banking industry. In the opposite direction, pooling all time periods can also affect conclusions. Minton et al. (2017) pool data over a long horizon and find that differences between the cost of capital for large and small banks are fully captured by the Fama and French (1993) three-factor model. In contrast, we see differential changes in expected returns for the twenty largest banks when we split the time periods up by significant dates in bank regulation.

What is driving these changes in the cost of capital for banks? From an asset pricing perspective, the cost of capital is determined by a firm's exposures, or betas, to systematic risk, as well as the price of systematic risk as perceived by investors. Narrowing our sample to the set of bank holding companies and banks for which we have regulatory income statement and balance sheet data, we can understand how much of the change in the cost of capital is associated with changes in banks' asset mix, leverage, and liquidity. Changes in these variables should affect the systematic risk of bank businesses, reflecting managerial choices as well as regulation. In either case, highlighting the coefficients on observable characteristics provides further insight into what drives the cost of capital for banks.

In value-weighted regressions, we find that having more loans, less risky loans, more deposit funding, and more liquidity coverage are all associated with a lower cost of capital for banks. In fact, adding controls for asset risk as measured by non-performing loans or controlling for the shift in the asset mix away from loans and into trading accounts for much of the increase in the cost of capital for banks relative to the pre-GLB period, but little of the decrease in the cost of capital since the passage of the DFA. In contrast to Baker and Wurgler (2015), we find that the Tier 1 capital ratio is positively related to the cost of capital (or is not significant in in the cross section of banks once other characteristics are considered). After controlling for a broad set of observables, notable periods with different levels for the cost of capital for banks include the great moderation (about 1.5% lower), the period immediately following the financial crisis but before the passing of the DFA (approximately 5% higher), and the current period (about 1% higher).

In addition, the cost of capital for the very largest banks relative to smaller banks is significantly lower after Dodd-Frank mandated stress testing, by as much as 4 percentage points. This is consistent with post financial crisis regulation differentially decreasing perceived systematic risk for the very largest banks.

A final contribution of the paper is our synthesis of the literature to propose and implement an empirical approach for calculating the cost of capital. We estimate the cost of capital not only for banks, but also for the entire CRSP-Compustat universe of public firms from 1996 to 2017. One challenge in estimating the cost of capital is that the academic literature offers a myriad of models and methodologies to consider. For example, within the class of factor models alone, the cost of capital depends on choices of factors, estimation windows, periodicity of data, as well as how to estimate both the factor loadings, or betas, and the factor risk premiums, or prices of risk. We elect to focus on the CAPM for our baseline results because it is a benchmark single-factor equilibrium model that is easy to interpret. It is also an important metric because confidential supervisory work as well as survey evidence suggest that it is favored by practitioners (Graham and Harvey 2001), meaning that it influences corporate decision making. We define the cost of capital as the risk-free rate plus a time-varying beta multiplied by a constant equity risk premium.

As a robustness check, we also present results from a three-factor model with time-varying betas, a weighted average cost of capital measure, and a one-factor model with a time-varying equity risk premium. These measures sometimes differ from our baseline CAPM cost of capital estimates. However, across our estimates of expected equity returns, we consistently find a significant decrease in the cost of capital for the largest banks since the passage of the DFA, with cost of capital estimates that are sometimes lower in the current period relative to the pre-GLB period.

The rest of the paper proceeds as follows. Section 2 presents a review of the literature on the cost of capital and the use of market measures to estimate the effects of changes to regulation. Section 3 describes our approach to calculating the cost of capital. The empirical approach to understand changes in the time series of the cost of capital is described in Section 4. Section 5 discusses our results. The paper concludes with a summary of our findings as well as a discussion of the limitations of the approach.

2 Literature Review

There is a long literature devoted to estimating the cost of capital for firms. Empirical studies often exclude the banking industry due to differences in accounting ratios such as leverage between banks and non-financial firms. One of the first papers to look at financial firms was Barber and Lyon (1997) who sought a sample not used in the original identification of the three-factor Fama and French (1993) model. Barber and Lyon (1997) find similar relationships between size, book-to-market and stock returns for financial firms and non-financial firms. Schuermann and Stiroh (2006) look at a sample of bank stock returns from 1997 to 2005, adding bank specific factors such as such as interest rate and credit variables. Their conclusions for banks are twofold – first, the market factor (RMRF) dominates, followed closely by the size (SMB) and value (HML) factors from Fama and French (1993). They do not find significant explanatory power from rate and credit factors. Second, they find evidence of correlated residuals, suggesting the possible presence of additional factors that price bank equity returns. Adrian et al. (2016) identify two additional factors that account for much of these correlated residuals – financial sector return on equity (FROE) and the spread between financials and the market (SPREAD). In addition to these factors, Gandhi and Lustig (2015) study differences in returns of large and small banks, identifying a size-dependent factor that they hypothesize captures tail risk. They study the reaction of this factor to regulatory changes, such as the Graham-Leach-Bliley roll-back of the Glass-Steagall Act, and find that the implied subsidy to banks increases when regulations are relaxed. Related to this finding, King (2009) documents a fall in the CAPM cost of capital for 89 global banks in the early 2000s.

In relation to the CAPM, Baker and Wurgler (2015) demonstrate that the low risk anomaly holds within the cross-section of bank stocks. Banks with low (high) betas earn higher (lower) returns than predicted by the CAPM. As a result, their study highlights the weak relationship between cost of capital estimates from the CAPM and the realized returns of bank stocks. This motivates our estimation of the Fama and French (1993) three-factor (FF3) model as a robustness check for the CAPM analysis. While there are multi-factor models that provide superior in-sample fit relative to the CAPM and FF3, we are reluctant to use these larger models for our baseline analysis. The more the factors diverge from a micro-founded asset pricing model, the harder they may be to interpret from the perspective of a manager looking to estimate a discount rate for the systemic risk of the cash flows for a marginal project.

Another strand of literature relates changes in regulation to market measures.These papers often focus on Tobin's q, but sometimes include measures of the cost of equity as well. Minton et al. (2017) find that Tobin's q is lower for large banks than for small banks and decreases with asset size when a bank exceeds the Dodd-Frank threshold. They estimate cost of capital for banks from 1987 to 2006 using both a three and five-factor models and argue that after including the size factor, the price of risk for the largest banks (greater than $50 billion) is similar to that of smaller banks. Similarly, Calomiris and Nissim (2014) explore the relationship between market-to-book and bank characteristics after the crisis. They attribute changes in valuations subsequent to the crisis as arising from a decline in the value of intangibles rather than changing regulations, including changes in intangible loan and deposit relationships, market valuation of non-interest income and steepness of the yield curve. Huizinga and Laeven (2012) examine how Tobin's q relates to the composition of assets of large banks, finding that lower levels of market-to-book after the financial crisis reflect asset re-valuations, particularly for real estate loans at larger banks. While many papers focus on a single measure, including our analysis of the cost of capital, Sarin and Summers (2016) compare various market measures of risk before and after the crisis (2002-2007 vs. 2010-2015) for the largest domestic and international banks. Comparing those time periods, they find flat or higher levels of volatility, beta, and risk for most measures for big banks in the post-crisis period.

We add to this literature a comprehensive empirical study comparing the prevailing methods of calculating the cost of capital and identifying ways in which these measures offer similar or different implications for changes in the cost of capital for banks since 1996. Rather than proposing a new method or additional factor, we think about the implications for bank managers of the different measures and how measure choice might have different implications.

3 Estimating the cost of capital

The cost of capital depends on the expected return of equity investors as well as the time value of money as captured by the risk-free rate. Empirically, expected stock returns are not observable. Instead, we must rely on economic or statistical models to estimate expected returns. As a result, any test regarding the cost of capital is a joint test of the null hypothesis and the model that is used to estimate expected returns (Fama 1970, 1991). Most of our analysis focuses on the cost of equity, which is often emphasized in the banking industry. However, in Section 5.6, we also analyze the weighted average cost of capital, which incorporates measures of the cost of debt and deposits that comprise the vast majority of bank funding.

A key challenge when measuring the cost of capital is stock market volatility. Excess volatility creates a large noise to signal ratio that makes estimating expected returns difficult. To see this, note that even with a constant risk premium and log-normal returns, it would still take over 40 years to estimate the risk premium, or expected return, with a standard error of 3% when annualized volatility is 20% (Merton 1980). Empirically, this example turns out to be quite accurate. From 1978 to 2017, the average market risk premium has been 8% with a standard error of 2.5%.[3] The resulting confidence interval from subtracting and adding 1.96 standard errors ranges from 3.1% to 12.9%, almost 10% wide. In multi-factor settings such as the ICAPM of Merton (1973) or the APT of Ross (1976), the corresponding uncertainty in factor risk premiums, or factor expected returns, dominates the imprecision in estimating expected stock returns. As Fama and French (1997) put it, "our message is that uncertainty of this magnitude about risk premiums, coupled with the uncertainty about risk loadings, implies woefully imprecise estimates of the cost of equity."

In contrast to expected returns, time-varying volatilities and covariances can be estimated with precision using high frequency data (Merton 1980). As a result, the contribution of the uncertainty in betas, or factor risk loadings, to cost of capital estimates is relatively small compared to the uncertainty in expected returns, or factor risk premiums. An implication of this result is that changes in betas can plausibly identify changes in the cost of capital. In particular, if the CAPM of Sharpe (1964) and Lintner (1965) holds and the market risk premium is roughly constant over the period of interest, we can use time variation in precisely estimated betas to document how the cost of capital is changing for banks relative to other firms, even if there is large uncertainty surrounding the level of the cost of capital itself. However, if the true model is a multi-factor model or the market risk premium is time varying, analysis based on the CAPM assuming a constant risk premium may be biased.

With these limitations in mind, we estimate the cost of capital using the CAPM assuming a constant market risk premium. We focus on the CAPM for our baseline results because it is a benchmark single-factor equilibrium model that is easy to interpret. For example, while a number of studies reject the CAPM in favor of multi-factor models that do a better

[3] The market risk premium is estimated by regressing CRSP value-weighted returns in excess of the one-month Treasury bill rate onto a constant. Monthly returns are multiplied by 12 to compute an annualized estimate. The Newey-West standard error is 2.49% using 5 lags and the White standard error is 2.41%.

job of explaining in-sample average returns for various test assets, recent work by Berk and van Binsbergen (2016) concludes that investors use the CAPM, not multi-factor models, to make capital allocation decisions. In addition, other studies such as Linnainmaa and Roberts (2016) criticize multi-factor models for poor out-of-sample performance and data snooping. Given the uncertainty in estimating expected stock returns, it is perhaps not surprising that there is still an active debate regarding which model is to best to use. Acknowledging this, we also report cost of capital estimates using the Fama and French (1993) three-factor model for robustness.

We define our baseline cost of capital estimates for the CAPM as,

$$E_t[R_{i,t+1}] = R_{f,t} + \beta_{i,t} \cdot \mu. \tag{1}$$

The first term is the risk-free rate $R_{f,t}$. The second term is a time varying CAPM beta $\beta_{i,t}$. The last term is the equity risk premium μ, which we assume is constant. We set the risk-free rate to the three-month Treasury bill rate and the equity risk premium to 8%, the average CRSP value-weighted excess return from 1926 to 2017. The betas are estimated from one-year rolling regressions of firm level daily excess returns onto market excess returns. The market return is the CRSP value-weighted return obtained from Ken French's website. The estimates are ex-ante betas in the sense that each month the beta is computed using lagged daily data over the previous 252 trading days.

As the discussion makes clear, a number of alternative choices can be made when estimating the cost of capital. We have focused on factor models that rely on three components: the risk-free rate, the factor loadings, and the factor risk premiums. There are multiple ways to estimate each of these components. For example, one could estimate the risk-free rate with the one-month Treasury bill or overnight index swaps instead of the three-month Treasury bill. This choice has a minor impact on the level of the cost of capital that affects all firms equally. In most of the specifications, we will subtract the risk-free rate from the cost of capital estimates to make the differences-in-differences even easier to interpret.[4] Other choices such as the method for estimating the factor loadings and risk premiums have a larger impact. For example, to name a few methods from a large literature, betas can be estimated from five year rolling regressions with monthly data, one year rolling regressions with daily data, and directly from estimates of firm level volatility and firm level correlation with the market.[5] Betas may also use lagged, centered, or forward data depending on the

[4]Since we have an unbalanced panel, changes in the number of firms over time will allow the level of the risk-free rate to potentially impact the estimated difference-in-difference coefficients in the panel regressions when the dependent variable is the expected return rather than the excess expected return.

[5]For example, see Scholes and Williams (1977), Fama and French (1997), Lewellen and Nagel (2006), Ang

application. Given our interest in how the cost of capital has varied over time, we prefer using daily data (252 observations per year) to deliver more precise and less biased estimates in comparison to slow moving estimates from monthly data (60 observations per five years).

Finally, one must decide how to estimate the factor risk premiums. We do this by using the simple time-series average of tradeable factor excess returns. An alternative approach is to allow for time-varying factor risk premiums from return predictability regressions, equilibrium models, or dividend discount models (Duarte and Rosa 2015). While there is ample empirical evidence that risk premia do vary over time (Cochrane 2011), estimating time-varying risk premia is challenging due to the aforementioned difficulties in estimating expected stock returns. Welch and Goyal (2007) find that many estimates of the equity risk premium are unstable out-of-sample, underperforming the historical mean model that we use in this paper. An implication of our approach is that we rely on time-series and cross-sectional differences in betas to identify changes in the cost of capital over time. As a robustness check, we also present results from a one-factor model with a time-varying equity risk premium.

4 Changes over time in the cost of capital

Changes in expected returns for the banking industry over time are shown in Figure 1, which shows the monthly value-weighted average cost of capital for banks, with horizontal lines at the means of the different regulatory time periods. By calculating these averages in a time series panel regression format instead of looking at simple averages, we can control for differences in the composition of the panel and for firm characteristics while adjusting the standard errors to account for the fact that the observations are not independent (neither over time nor within firm). This allows us to construct confidence intervals around our time period measures, as well as to build differences-in-differences specifications comparing changes in estimated expected returns for all the non-bank firms in the CRSP database to changes in expected returns of banks.

4.1 Regulatory time periods

We compare changes in the cost of capital across time periods in which bank regulations changed from 1996 to 2017. The periods are:

1. Basel I: Pre-period (March 1996 to October 1998)

2. GLB: The Graham-Leach-Bliley Act (November 1999 to December 2006)

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and Kristensen (2012), Frazzini and Pedersen (2014), Baker and Wurgler (2015), and Adrian et al. (2016).

3. Crisis: The Financial Crisis (January 2007 to April 2009)
4. SCAP: The Supervisory Capital Assessment Plan (May 2009 to June 2010)
5. DFA: The Dodd-Frank Act (July 2010 to December 2017)

We define break points as the month of the passage of the relevant banking law. Results are similar if we vary the time periods within a few months to capture anticipation of the passage of the law. To see how the cost of capital has changed over time, we begin our analysis by estimating the following specification:

$$E_t[R_{i,t+1}] = \alpha + \beta_1 \cdot GLB_t + \beta_2 \cdot Crisis_t + \beta_3 \cdot SCAP_t + \beta_4 \cdot DFA_t + e_{i,t} \tag{2}$$

where GLB_t, $Crisis_t$, $SCAP_t$, and DFA_t are binary variables equal to one during the periods defined above. The omitted pre-period begins twenty years ago in 1996 and thus is characterized by the Basel I regulatory regime.

The estimated coefficient for each time period is the difference between the average cost of capital in that time period relative to the pre-period, whose value is captured by the constant term. The null hypothesis is that all β are equal to 0 – meaning that there have not been any changes to expected returns over time and that as a result, regulatory changes have not changed the cost of capital. We estimate the specifications both on a value-weighted basis, which gives us an understanding of changes for the industry in aggregate, as well as on an equal-weighted basis, which places equal value on each company in the panel. Standard errors are clustered by firm and by month. Results are similar if the analysis incorporates earlier data (back through 1986), however, we focus on the more recent time period to have consistency in the regulatory data, which becomes available for all fields used in the analysis in 1996:Q1.

4.2 Sample selection and definition of banks

We use CRSP, Compustat, and regulatory data from call reports and Y-9C filings from March 1996 to December 2017 for our baseline analysis. We estimate the cost of capital for all CRSP firms with share codes 10 or 11 that are traded on the NYSE, NASDAQ, or AMEX. Later in the paper we also estimate the weighted average cost of capital (WACC) by merging quarterly Compustat data onto monthly CRSP data using the most recent observation that was announced prior to the start of the month (based on RDQ date). We filter observations from this dataset with missing cost of capital estimates or missing Compustat asset data as well as observations with share prices that are less than one dollar. The resulting sample includes a panel of 1,110,968 firm-month observations.[6]

Defining banks within this sample is not straightforward. Limiting banks to depository institutions in SIC code 60 would exclude firms that became bank holding companies after the financial crisis in 2009 that are subject to financial regulation that is a key object of interest in this analysis. We therefore expand our definition to include both firms that are depository institutions (SIC code 6020-6036) as well as firms that have an RSSDID (the unique identifier assigned to financial institutions by the Federal Reserve) between the first and the last dates when regulatory assets from Y-9C filings are within 10% of total assets from Compustat. Firms that fulfill either of these criteria in month-t are identified as banks by the binary variable $Bank_{i,t}$. We identify RSSDIDs using the FRBNY RSSDID-Permco crosswalk, which matches banks between Compustat and regulatory reports using name, city and state, and financial variables.[7] Of the 11,959 firms in the sample, 1,414 firms are identified as banks throughout the sample while 33 firms are identified as banks for only part of the sample, including Metlife, Goldman Sachs, and Morgan Stanley. Because we include savings and loans in our definition as banks, and these firms only file call reports after 2012:Q1, there are fewer banks with regulatory data than there are total banks. The result is a sample containing 98,578 bank-month observations for banks with regulatory data when all regulatory variables are available as compared to 142,100 bank-month observations for the cost of capital.

[6] In the event that firms issue multiple securities, we obtain unique firm-month observations by retaining the PERMCO-date pairs for the security (PERMNO) that has the largest market capitalization each month. Our use of the most recent quarterly accounting data from Compustat is similar to Hou et al. (2014) and Adrian et al. (2016) who form portfolios based on recent quarterly earnings data. This differs from Fama and French (1993) who form portfolios annually.

[7] Banks are defined using SIC codes and the FRBNY crosswalk as of 2016q4. SIC codes are obtained with descending priority from Compustat historical, Compustat header, CRSP historical, or CRSP header data depending on availability following the procedure outlined in Adrian et al. (2016). This definition of banks differs from an entirely SIC code / NAICS driven approach. For example, 24 companies with SIC code 6099 (functions related to depository banking) are not coded as banks at some point in our sample. This subset includes some of the credit card companies that do not have an RSSDID or regulatory assets that match Compustat data (i.e. Mastercard, Visa). At the same time, 13 companies with an SIC code beginning with 62 are coded as banks in our analysis (i.e. Goldman Sachs, Morgan Stanley). We exclude AIG and CIT from the sample.

4.3 Difference-in-differences across industries

We estimate our first difference-in-differences regression by adding an indicator variable for banks that is included in the regression and interacted with each of the time period dummies,

$$\begin{aligned} E_t[R_{i,t+1}] = \alpha + \beta_1 \cdot GLB_t + \beta_2 \cdot Crisis_t + \beta_3 \cdot SCAP_t + \beta_4 \cdot DFA_t + \\ + \rho \cdot Bank_{i,t} + \delta_1 \cdot GLB_t \cdot Bank_{i,t} + \delta_2 \cdot Crisis_t \cdot Bank_{i,t} \\ + \delta_3 \cdot SCAP_t \cdot Bank_{i,t} + \delta_4 \cdot DFA_t \cdot Bank_{i,t} + e_{i,t} \end{aligned} \tag{3}$$

This specification allows the cost of capital to change differently for banks and non-banks around the time periods when bank regulation changed. When we estimate δ that are greater than 0, it means that the change to the cost of capital for banks relative to the pre-period is greater than the change for non-banks. The panel of banks changes over time in ways that may change our estimates of the cost of capital. For example, when a number of very large broker dealers and credit card firms become bank holding companies in 2009, to the extent that these firms have different costs of capital relative to their new industries, the time period dummies and interaction terms will pick up these changes. There are also changes in the sample of banks and non-bank firms for reasons other than changing industry definitions. For example, private firms may enter the sample by going public and public firms may exit the sample as a result of mergers and acquisitions activity. We mitigate these issues by estimating the same regression absorbing firm fixed effects. This allows us to control for changes in the composition of the sample over time and to narrow our focus only to the effects of regulatory changes within firms. In some specifications, we include controls for $Leverage_{i,t}$, which is defined as total debt divided by the market value of assets (total debt plus the market value of equity). We add total deposits to the Compustat measure of total debt to calculate leverage for banks, because the Compustat definition of total debt does not include deposits. In unreported regressions, we include 3-digit SIC code fixed effects as controls and expand the the definition of banks to include all firms that have RSSDIDs, and results are similar.

4.4 Top Firms

While the difference-in-differences regressions highlight the change in the cost of capital for banks relative to other firms, they potentially conflate the impact of changing regulation with other sources of time variation in the cost of capital. In order to understand the impact of post financial crisis regulation, we look more closely at the subset of banks most affected by post financial crisis regulatory changes, banks with more than $50 billion in assets. The cost of capital for the very largest firms in any industry may be different from that of smaller firms, due to differences in business mix, diversification, and risk. In fact, size explains residuals in a single factor model, and is a priced risk factor in the Fama French three factor model. Further, the relationship between size and expected returns can change over time. To correctly determine the impact of regulation, we then need to ensure that when we look at changes to the cost of capital for the very largest banks, that we difference out changes in the cost of capital for the very largest non-bank firms.

Banks with more than $50 billion in assets are approximately the twenty largest banks in the US, so we create a dummy variable for each industry capturing the largest twenty firms in that industry ("Top") as measured by total assets. This gives us a measure that we can use over a longer time series and across industries. We repeat the analysis from equation 3 adding interactions between our coefficients of interest and the $Top_{i,t}$ dummy variable. When the interaction of Top, time period, and bank is statistically significant, this indicates that the difference between Top banks and smaller banks is different than the difference between Top non-banks and non-Top firms in the current period relative to the pre-period.

4.5 Regulated Banks

In addition to the analysis comparing banks and Top banks to other industries, we also zoom in on a panel of regulated banks for which we have detailed income statement and balance sheet data from regulatory filings (call reports and Y-9C). This allows us to study how the cost of capital has changed over time while controlling for observable characteristics that are targeted by regulation such as bank capital and liquidity, as well as for changes in asset and liability mix. This allows us to estimate the effect of bank characteristics on the cost of capital from the regression:

$$\begin{split} E_t[R_{i,t+1}] = \alpha + \beta_1 \cdot GLB_t + \beta_2 \cdot Crisis_t + \beta_3 \cdot SCAP_t + \beta_4 \cdot DFA_t + \\ \phi_1 \cdot Asset\,Composition_{i,t} + \phi_2 \cdot Funding_{i,t} + \phi_3 \cdot Risk_{i,t} + e_{i,t} \end{split} \tag{4}$$

where $Asset\,Composition_{i,t}$ measures include the fraction of loans to assets and the concentration of assets (the HHI of the bank asset mix in credit card loans, residential real estate, commercial real estate, C&I, investment securities, and trading assets). Funding is captured by the proportion of total liabilities funded with deposits, a proxy for the liquidity coverage ratio (weighted assets divided by weighted liabilities including off balance sheet commitments x 100)[8], as well as the Tier 1 capital ratio. Asset risk is proxied by the ratio of risk weighted

[8]LCR proxy uses regulatory data to approximate the LCR ratio as follows: Assets are weighted and include: Cash, FF Repo, US treasury, Agency Securities, Municipal securities, MBS, Other securities, Loans. Liabilities include respective weights times the following: FF Repo, Trading Liabilities, Commercial Paper,

assets to total assets and by the ratio of non-performing loans to total loans. All balance sheet items are measured as of the most recent quarter. Summary statistics for the panel of firms are presented in Panel A of Table 1. Panel B tabulates the value-weighted average of observable characteristics in each regulatory regime, illustrating how the asset composition, funding mix and asset risk of the banking industry have changed over time.

4.6 Effect of Stress Testing

Finally, we look in detail at the effect of a particular regulatory change on the cost of capital. We adapt to the cost of capital the approach of Flannery et al. (2017), who analyze the abnormal returns of firms subjected to US stress testing. We estimate:

$$\begin{gathered}E_t[R_{i,t+1}] = \alpha + \beta_1 \cdot GLB_t + \beta_2 \cdot Crisis_t + \beta_3 \cdot SCAP_t + \beta_4 \cdot DFA0_t + \beta_5 \cdot DFA1_t + \\ \beta_6 \cdot ST_{SCAP,i} + \beta_7 \cdot ST_{CCAR,i} + \beta_8 \cdot ST_{SCAP,i} \cdot SCAP_t + \beta_9 \cdot ST_{SCAP,i} \cdot DFA0_t + \\ \beta_{10} \cdot ST_{SCAP,i} \cdot DFA1_t + \beta_{11} \cdot ST_{CCAR,i} \cdot DFA1_t + \beta_C \cdot X_{i,t} + e_{i,t}\end{gathered} \tag{5}$$

Each specification includes a non-overlapping set of time fixed effects as well as controls for bank holding company characteristics $X_{i,t}$. We split the banks into two groups based on the timing of their exposure to public disclosure of Federal Reserve stress testing. The first 18 banks exposed to stress testing are captured by the binary variable, $ST_{SCAP,i}$, which is equal to 1 for the largest BHCs that were initially included in stress tests beginning with SCAP in 2009. The second group of 6 banks were subject to Comprehensive Capital Analysis and Review (CCAR) stress tests starting in 2014 ("CCAR 2014 Addition"). $ST_{CCAR,i}$ is equal to 1 for this group. The regulatory time periods are also changed to accommodate the phased implementation of stress testing by splitting the Dodd-Frank Act (DFA_t) period into two sub-periods before and after the expansion of firms subject to stress testing:

1. $DFA0_t$: The Dodd-Frank Act and 18 firms ($ST_{SCAP,i}$) subject to stress testing and associated disclosure (July 2010 to August 2013)

2. $DFA1_t$: Additional 6 firms ($ST_{CCAR,i}$) subject to stress testing and associated disclosure (September 2013 to December 2017)

As in Flannery et al. (2017), we limit the panel of banks to firms with assets greater than \$10 billion to ensure that our comparison group of non-stress tested banks is more similar to the stress tested banks.

OBM, Subdebt, Deposits. Off balance sheet securities include respective weights times the following: Unused commitments, Financial Standby Letters, Securities underwritten, Securities lent.

5 The impact of regulation on the cost of capital

Over the last twenty years, value-weighted expected returns for banks averaged 11.5%, based on an unbalanced panel of 1,447 banks, which had realized returns of 8.8%. This compares to expected returns for non-banks of 10.0%, and realized returns of 10.1% (value weighted, based on an unbalanced panel of 10,545 non-banks). As mentioned in Section 3, we set the level of the equity risk premium to 8% for our baseline cost of capital estimates. In contrast, the risk-free rate averaged 2.2% over our sample period. Table 2 presents the results from estimating equation 2 on different panels of firms for different measures of the cost of capital. Firms are subset into panels of banks and non-banks. Dependent variables include the CAPM, CAPM - Rf, FF3 - Rf, WACC-Rf as well as Realized-Rf, the monthly realized equity excess return multiplied by twelve. Regressions are estimated on an equal-weighted basis as well as a value-weighted basis. The value weights are proportional to lagged market capitalization and are normalized each month by the total market capitalization of all firms in the panel. Each column is the estimated coefficient on the time series dummy for the different regulatory regimes, while the estimated coefficient on the constant term represents the average (in the EW regressions) or weighted average (in the VW regressions) for the pre-GLB time period. The average level of the estimated cost of capital in any time period can be calculated by summing the coefficient for the time period with the constant. Standard errors are clustered by month and by firm, and thus when the coefficients on the regulatory time series dummies are statistically significant, it means that the average in that time period is statistically significantly different from the pre-GLB time period.

5.1 Difference-in-differences across industries

In order to see if there are differences in the differences between the cost of capital for banks and non-banks, we combine all firms into a single panel, estimating the specification outlined in equation 3. We begin with expected returns as estimated by the CAPM, which is the dependent variable in the first six specifications of Table 3 estimated on the value-weighted CRSP-Compustat universe. The cost of capital varies significantly over time, and every coefficient in the first column is negative, meaning that the cost of capital is lower than it was in the late 1990s. The dramatic 4 percentage point fall in the cost of capital after the financial crisis mostly reflects changes in the risk-free rate.

The second column of Table 3 presents the main difference-in-difference analysis. When the interaction of bank and time period indicator variables are significantly different from 0, this means that the average cost of capital for banks, relative to the pre-period, has changed differently from that of non-banks. The difference between the Current and the

SCAP coefficients is the difference-in-differences between the cost of capital in the current period after DFA was passed relative to the pre-period minus the cost of capital after the financial crisis relative to the pre-period. Over the last two decades, the bank dummy variable indicates that the value-weighted cost of capital for banks was about 70 basis points higher than that of other firms, on average, consistent with relatively higher systematic risk and a value-weighted beta of 1.17. But this premium has changed over time – in the GLB period, the cost of capital for banks was unusually low. In the current time period, the cost of capital for banks is 3% lower than in the pre-period (current coefficient of -4.91 + bank x current coefficient of 1.91). The difference-in-difference for the current period between banks and non-banks is 191 basis points, which is economically and statistically significant. Changes in banks' cost of capital diverged the most from non-banks in the period immediately following the financial crisis and prior to the passage of the Dodd-Frank Act – comparing the current period to the post financial crisis period, banks' cost of capital fell by approximately 5% (SCAP coefficient of 6.55 - Current coefficient of 1.91), while the change in the cost of capital in those time periods for non-banks was roughly zero. This is consistent with post-financial crisis regulation enacted in 2010 reducing risk differentially for banks, and returning the expected capital for banks back to the pre-deregulation period (pre-GLB).

The next two columns of Table 3 explore the robustness of this finding. In the third column, we control for differences in the composition of the panel by looking at changes in the estimated cost of capital only within firms. This controls for the fact that the panel of firms is unbalanced over time. The results indicate that the change in the cost of capital for banks is not driven by the addition of non-depository institutions such as investment banks and credit card banks to our definition of banks in 2009 – results are similar to those shown in column 2. Similar to the cross-sectional results, the within firm cost of capital for banks differentially increased after the financial crisis and has fallen around 4.5% since then. The magnitude of this decline is significant and much larger than that of non-banks. At the same time, the cost of capital for banks has returned to a level around 2.5% higher than the cost of capital during the pre-GLB period. This could be consistent with an increase in the perceived riskiness of the industry due to reduced probability of government assistance, a re-evaluation of the risks of the banking industry in general, or with an increase in the systematic risk of the baking industry.

In column 4, we limit the sample to banks and non-bank financial intermediaries. In this specification, the estimated coefficient on bank x SCAP falls by almost half. This indicates that some of the increase in banks' cost of capital reflected market wide changes to the cost of capital for all financial intermediaries in that time period. The cost of capital for banks still fell by more than for non-bank financial intermediaries after 2010 (the difference between the current coefficient of 1.43 and the SCAP coefficient of 3.69 is negative and economically and statistically significant).

To the extent that different banks serve different borrowers, it is important to understand the changes not just on an industry level, but on an equal-weighted basis. Specifications 5 and 6 are equal weighted and thus tell us about the change in the cost of capital for the average bank, adding more weight to smaller firms than the value-weighted specifications. In contrast to the cross-sectional results in column 2, when banks are equal-weighted, the change in the cost of capital after the financial crisis is much smaller. In fact, in the cross section, the current time period is the lowest cost of capital for the average bank (specification 5). However, looking within firms (specification 6), the signs flip and we see that that fall in the cost of capital comes from changes to the panel, since within firm, the cost of capital differentially increased for the average bank relative to the pre-GLB time period, and is not significantly lower in the post DFA period than it was before 2010. Overall these results are consistent with most of the cost of capital changes arising from changes to the largest banks. We will explore this question in detail in the next section.

The last two columns of Table 3 repeat the analysis, but with a dependent variable of the expected return less the risk-free rate (CAPM-Rf). If the panel were balanced and if the time period dummies were replaced with time fixed effects, the bank interaction coefficients in columns 7 and 8 would be identical to those in columns 3 and 6. However, since there are not the same number of firms in each time period and because the time period dummies are more coarse than monthly time fixed effects, the coefficients are slightly different, with the time period dummies only picking up some of the change in the risk-free rate. In order to ensure that our subsequent analysis is not capturing changes in the risk-free rate, the remainder of the paper studies estimates of the cost of capital less the risk-free rate as the dependent variable.

5.2 Top Firms

Over the last twenty years, the cost of capital for the largest firms in an industry has averaged over 1 percentage point lower than the cost of capital for smaller firms. This may reflect differences in systematic risk, market beliefs about implicit government support, or an association between firm size and market power.[9] Hale and Santos (2014), for example, find that all large firms pay lower rates for bonds, and the very largest banks pay differentially lower rates than non-banks. This is a particularly important concern for this study, because

[9]While large companies may be better diversified and thus have lower idiosyncratic risk, they may be more exposed to the economy in general and have higher systematic risk, which is the only risk priced in CAPM.

some of the regulatory changes that we are interested in are particularly relevant to the largest banks. In particular, the Dodd-Frank Act has several provisions which are applicable only to the largest banks.

We explore differences in expected returns by size in Table 4. In the first specification, we document the general patterns in expected returns – While Top non-banks have lower expected returns than non-Top companies, Top banks have 3.5% higher expected returns than non-Top banks. The remaining specifications include interactions between our size indicator and the time periods to understand how these differences play out as regulations change. Consistent with our initial concerns about measurement, we estimate the difference between the largest firms and other firms in Column 2 and find that this difference has changed over time for nonbanks as well. Since the GLB period, the extent to which the largest firms have a lower cost of capital than do smaller firms has increased for all companies – the estimated coefficients on the interaction of Top and the various time period indicator variables are all negative and statistically significant. Since GLB, expected returns for the largest firms have consistently been around 2% lower than for non-Top firms, regardless of the bank regulatory regime. The very largest banks have shared in the overall decline in the cost of capital of the very largest non-banks, with the notable exception of the post-crisis SCAP period, when the wedge between Top banks and banks differentially increased by as much as 4%, a difference that reverted in the post DFA period.

Controlling for time invariant differences across firms, the cost of capital has fallen more for the very largest banks relative to the pre-GLB period, as indicated by the coefficients on Bank x Top x Current which are almost all negative, although not always statistically significant. While the within firm specifications have the advantage of controlling for the panel composition, it has important limitations as well, primarily that the coefficients for the Bank, Top, and Bank x Top indicators are estimated off the firms that switch between being banks and top firms. In other words, the former approach captures many more firms when estimating these coefficients, while the latter approach is more cleanly identified. Relative to pre-GLB, the fall in the cost of capital for the very largest banks is even larger if we compare changes to only non-bank financials, although looking at the change between SCAP and Current, the drop in cost of capital for the very largest banks is no longer statistically significant. In specification 5, we add leverage as a control and results are similar. We explore the impact of changing leverage and other financial variables further in Section 5.3. The final two columns repeat the analysis on an equal-weighted basis.

In summary, looking across the various specifications in Table 4, after controlling for changes in the composition of the panel, we find a negative relationship or no statistically significant difference between how the cost of capital has changed for the very largest banks relative to the very largest non-banks. Further, the difference between the coefficient on Bank x Top x Current and Bank x Top x SCAP (the cost of capital immediately before and after DFA) is consistently negative and statistically significant in most specifications, meaning that the current cost of capital for banks has fallen since DFA. Perhaps the best identified test of the effect of changes in regulation since DFA comes in specification 4 in which we limit the panel to only banks and non-bank financials, and estimate within firm effects. In this specification, we estimate that the cost of capital for the very largest banks relative to all non-banks is differentially lower by 245 basis points since pre-GLB. The difference has fallen by 118 basis points since the financial crisis, although this difference is not statistically significant.

5.3 Regulated Banks

How and why did the cost of capital change for banks? While any consideration of the changes to the cost of capital for banks must take into account changes in the cost of capital for other firms, we can learn about the impact of regulation from looking more closely within the universe of regulated banks. In Tables 5 through 6, we focus on the 1,023 publicly traded banks with regulatory data. We continue to employ the difference-in-differences strategy, including the full panel of companies and adding dummy variables if companies are missing regulatory data, however we do not show the coefficients on non-banks as in Tables 3 and 4, and show only the Bank x Time interactions as well as the coefficients on the regulatory data, which is populated only for banks.

5.3.1 Bank Characteristics

Changes in regulation may change the cost of capital by changing bank risk, capital, liquidity and bank business models. Alternately, the market's evaluation of the risk inherent in those business models may change over time. Finally, bank business models may change in response to expectations of competitive opportunities, and competitive opportunities will again change expected returns. We explore these questions in Table 5, by progressively adding additional controls to each specification. Summary statistics on observable variables are presented in Panel A of Table 1. The extent to which the banking industry has changed over time is shown in Panel B of Table 1, where each column tabulates the value within a time period. Values are presented as averages weighted by market capitalization so that the sum adds up to the value-weighted industry.

First, we consider separately each type of change, beginning in specification 2 of Table 5, with changes to bank assets. Banks with more concentrated assets and banks with more loans have lower expected returns – banks with one standard deviation more loans to assets have 40 basis point lower expected returns. Loans have fallen from almost 60 percent of assets to 47 percent in the post DFA era, while trading assets have grown from 5.8 percent to a post crisis high of 11.5 percent, which subsided to 8.9 percent on average in the post-DFA era. Asset concentration has remained relatively flat. This mix away from loans and into trading accounts for a large fraction of the differential increase in expected returns for banks. After controlling for this mix shift, the coefficient for the Bank x Current interaction term falls by about one third. This change, however, does not account for difference between the post SCAP period and the current period which continues to be 4-5% and statistically significant.

In the third specification we add controls for asset risk which include the fraction of non-performing loans to total loans (NPLs) and the fraction of risk-weighted assets to total assets (RWA), both of which have changed over time. The relationship between NPLs and expected returns is of the expected sign - firms with higher risk, as measured by higher NPL rates, have higher expected returns. The increase in NPLs from 1 percent in the pre-period to 2.7 percent in the post DFA period accounts for around 50 basis points of the increase in expected returns for banks, with the Bank x Current interaction term becoming less significant and decreasing by almost 100 basis points. In contrast, the coefficient on RWA is negative and significant. This result is inconsistent with a positive risk-return trade-off or suggests that RWA is not a meaningful proxy for risk after controlling for NPLs. Interestingly, the RWA coefficient reverses and becomes positive in specifications 6 and 7 that control for all observables in the cross-section and within firm, indicating that RWA may not be inconsistent with a positive risk-return trade-off after all.

The fourth specification considers the relationship between equity (as measured by the Tier 1 capital ratio) and expected returns. The results indicate that there is a positive relationship between the Tier 1 capital ratio and the CAPM cost of capital that later becomes insignificant in specification 6. This finding contrasts Baker and Wurgler (2015) who document a positive relationship between the inverse Tier 1 capital ratio and forward-looking CAPM betas that are estimated from rolling regressions using up to five years of monthly data. The different results may stem from either the different methods for estimating CAPM betas or from the Bank x Time period interaction coefficients capturing part of the relationship between leverage and CAPM betas. To interpret these results further, we can note from Baker and Wurgler (2015) that the low risk anomaly is present for bank stocks as well as for non-banks. As a result, if there is a negative relationship between CAPM betas and the Tier 1 capital ratio as in Baker and Wurgler (2015), holding more capital may not decrease the realized cost of equity by as much as predicted by the CAPM. In comparison, if there is a positive relationship as in our results, holding more capital may not increase the realized cost of equity by as much as predicted by the CAPM.

We next look at how liquidity is priced into expected returns. Firms with more net liquidity and more deposits have lower costs of capital. On average, relative to the previous decade, banks have more liquidity but a smaller proportion of their funding comes from deposits. These changes largely offset each other when comparing the current period to the pre-GLB period, with expected returns increasing by about 28 basis points from the decrease in deposits while decreasing by about 23 basis points from the increase in the liquidity coverage ratio. These magnitudes are relatively small compared to some of the other controls considered above which is reflected in the smaller change for the Bank x Current interaction coefficient. In addition, while the coefficients on deposits and liquidity coverage remain negative in the cross-section (specification 6), the coefficient on liquidity coverage changes signs when looking within firm (specification 7), which suggests a different impact on the cost of capital when a bank is increasing its liquidity coverage rather than one bank having more liquidity coverage versus another bank.

As indicated above, specification 6 combines the characteristics into a single specification. Controlling for changes in the asset mix, asset risk, equity, and liquidity, expected returns for banks have sharply fallen since the financial crisis. To the extent that this time period effect captures regulatory changes that are not acting directly through levels of liquidity and capital, this is consistent with regulation reducing the cost of capital. Comparing the current time period to other time periods, expected returns were significantly lower in the GLB period by 2.6% and were still 1.2% significantly lower in the pre-GLB relative to the difference for non-banks.

The final specification adds firm fixed effects to estimate the coefficients from variation within firm and to account for changes in the composition of the panel. Interestingly, the sign on concentration becomes positive, which is consistent with the intuition that more concentration should be associated with higher risk and thus higher returns. Meanwhile, the cost of capital time period coefficients for banks are largely similar to specification 6. As a final check, we also investigate whether there is time variation in the coefficients on the bank characteristics that may reflect changes in the price of risk for different characteristics. Interacting the bank variables with the time periods for a total of 4 time periods x 7 characteristics, we find similar results in the Appendix (see Table A.3).

5.3.2 Large Banks

In Table 6 we repeat the analysis of Table 4 now adding controls for observable characteristics which may have changed over time. The *Top* measure corresponds approximately to the banks with more than \$50 billion in assets since 2008[10], precisely the banks that are subject to additional regulations in the Dodd-Frank Act. After adding the full suite of controls in specification 1 of Table 6, we find that the cost of capital for the very largest firms is either lowest in the current period or lower than at any time with the exception of the GLB period for the equal-weighted specifications. These differences-in-differences are particularly significant when comparing the SCAP to the current time period, but there are some specifications for which the cost of capital is significantly lower in the current period relative to the pre-GLB period. Otherwise the patterns for *Top* banks are similar to those for *Top* non-banks. Looking at the differences in the CAPM implied cost of equity less the risk-free rate, while the cost of capital for all banks has increased, the cost of capital for the very largest banks is 3% to 4% lower since the DFA. Rather than including the full suite of controls, in columns (3) and (4), and (7) and (8) we control only for changes in asset mix, similar to specification (2) of Table 5, since asset mix is not the direct target of regulation after the financial crisis. As in Table 5, we find that changes to asset mix explain most of the differential change in the cost of capital relative to the pre-GLB time period.

Looking within the banking industry we find differential increases in the cost of capital for the very largest banks following the financial crisis which have since retreated. Since these banks are differentially subject to increased regulation, this is consistent with an increase in regulation leading to lower risk and lower expected returns. We look specifically at a single regulatory change in the next section to lend weight to this interpretation.

5.3.3 Stress Tests

In this section we focus on a particular regulatory change, stress testing. While it is hard to attribute changes in the cost of capital to particular regulations because so many regulations were changed at the same time, we attempt to take advantage of the staggered implementation of stress testing on banks with more than \$50 billion in assets to understand how stress testing may have affected the cost of capital for stress tested banks.

Table 7 presents the results of this analysis. Rather than using an indicator for banks, we run a panel regression with the 90 largest banks by assets each month that have regulatory data and then use separate indicators for the sets of banks that became subject to stress

[10]The smallest of the top 20 banks had \$40-\$50B in assets before 2000. We find similar (unreported) results if we redefine the *Top* measure from 2008 to 2017 to be the banks with more than \$50 billion in assets (as opposed to the top 20 banks by assets).

testing at different times. Even though we limit the panel to the largest banks, stress tested firms are different from a cost of capital perspective relative to other large banks. Over the whole time period, the 18 firms subject to the initial stress testing in the SCAP with public market data have a 1% higher cost of capital (SCAP firm indicator). In contrast, the six firms added later with assets ranging from $50 to $250 billion do not have a higher cost of capital relative to other large banks (CCAR firm indicator). Note that not all firms that are stress tested are publicly traded – we exclude from the analysis the banks with foreign parents, and Ally and Citizens join the panel only after IPO.[11]

On average, the cost of capital increases for the large banks in this panel over time. The coefficients on the time periods are all positive and statistically significantly different from zero. Relative to the pre-period, the cost of capital is 7% higher after SCAP, 4% higher after the Dodd-Frank act is passed and prior to the initial disclosure of stress testing results in 2012, and 3.5% higher in the post stress testing CCAR period.

For the very largest banks that were initially subject to the SCAP, their cost of capital first increased, and then fell after the commencement of Dodd-Frank Act mandated stress testing. This is apparent in the first three rows of Table 7 where we allow the estimated coefficients on different time periods after 2009 to be different for the SCAP firms relative to other large banks and CCAR firms. After SCAP in 2009, the SCAP firms had 2 percentage points higher cost of capital. After the passage of the DFA, the differential cost of capital began to fall, and since CCAR in 2012, the cost of capital for the very largest stress-tested banks is lower by 164 basis points relative to other large banks, a result that is statistically significant at the 1% level (Table 7, specification 3). Controlling for bank characteristics in specification 4, the magnitude declines to 114 basis points, but is still negative and statistically significant.

The results indicate that the largest reduction in the cost of capital occurs for the very largest stress tested banks. This means that stress testing has differentially reduced risk captured in expected returns for the very largest firms. We cannot distinguish this hypothesis from the alternative explanation that other regulations to which only these very largest firms are subject have also been implemented with timing similar to that of CCAR, have lowered the cost of capital.

5.4 Three-factor cost of capital estimates

We have focused the discussion until now around the simplest one factor model to calculate expected returns. To understand the robustness of the results, we repeat much of the analysis

[11] Because of its bankruptcy and subsequent reorganization, we exclude CIT from this panel entirely. If included, it would be the only bank in its category, since it was added to stress testing in 2016, and it would be in the comparison, non-stress tested group before that time.

using the Fama and French (1993) three-factor (FF3) model. The FF3 model includes a market factor ($RMRF$), a size factor (SMB), and a value factor (HML), each of which is persistently positively associated with stock price returns. This model is interesting to consider in our context because it delivers cost of capital estimates that incorporate the variation in expected returns for small versus big firms and for value versus growth firms. This would be an advantage in the difference-in-differences specifications, for example, if this model better captures changes over time in asset concentration in the banking industry, which would result in a smaller loading for the banking industry on the size factor. More generally, misspecification of expected returns, if associated with the time periods we are measuring, could bias our results. However, the downside of multifactor models is that they do not appear to be used often by managers to estimate the expected returns of their investors. Further, they may be difficult for managers to interpret.

As before, we define the FF3 cost of capital estimate as the sum of time-varying betas multiplied by constant factor risk premiums. We set the factor risk premiums equal to the average excess returns for the tradeable factors from 1926 to 2017 which are equal to 8%, 4.6%, and 2.5% in annualized units for the market, size, and value factors respectively. The average beta or loading on these factors for banks over the last twenty years has been 1.17 (0.54), 0.85 (0.43), -0.11 (0.41) respectively versus 1.17 (0.55) for the CAPM on a value-weighted (equal-weighted) basis.

Figure 3 illustrates the results graphically. The top plot decomposes the value-weighted FF3 cost of capital for banks into contributions from the market, value, and size factors. As the plot indicates, value-weighted bank betas on the HML factor significantly increased during and after the financial crisis, a trend that has only slowly reversed over time. The increased value factor betas during the Crisis and SCAP periods increased banks' cost of capital in the FF3 model, consistent with banks having higher book-to-market ratios during these periods. At the same time, the magnitude of the loading on SMB for value-weighted banks increased during the SCAP period to become more negative. This lowered banks' cost of capital from the perspective of the FF3 model as the size factor has a positive risk premium (small firms have historically outperformed big firms). Relating this to our previous results, while the size risk premium is consistent with the negative coefficient on the Top indicator in Table 4 for nonbanks, it contrasts with the large and positive coefficient on the Top x Bank indicator, a difference that highlights a potential challenge when interpreting the FF3 results. Putting this issue aside, the net result for the FF3 model can be seen in the bottom plot of Figure 3 which reports the difference in the FF3 cost of capital for value-weighted banks and non-banks over the different time periods, much of which is being driven by the large increase in the value factor betas for banks.

Table 8 replicates the key specifications from Tables 3 and 4 for the FF3 cost of capital estimates. The second column presents the main difference-in-difference analysis outlined in equation 3. Compared to the previous results, the FF3 analysis indicates that the cost of capital for banks was over 8% higher than that of other firms on average. This is much larger than the level difference between banks and non-banks when the CAPM is used to estimate expected returns. Another difference in the FF3 model is that changes in banks' cost of capital diverged the most from non-banks in the period immediately preceding the financial crisis when value factor betas were declining rather than the period immediately following the crisis. Overall, however, the results are consistent with the CAPM results in that both models imply that the cost of capital for banks was differentially lower after GLB.

In the current period, the FF3 results indicate that the value-weighted cost of capital for banks has exhibited a statistically significant decline of about 1.7% relative to other industries. The Bank x Current coefficient remains negative in the value-weighted regressions with firm fixed effects, but there is now an increase in the cost of capital after DFA when looking at the difference-in-differences relative to non-bank financials (specification 4). As in the analogous equal-weighted CAPM regressions in Table 3, the coefficient on Bank x Current is positive and significant in the equal-weighted regressions with firm fixed effects. This suggests that the difference between the CAPM and FF3 value-weighted regressions is being driven by the largest banks.

To explore this possibility further, Table 8 reports the Top regressions in specifications (7) through (11) for the FF3 model. The results indicate that the cost of capital for the largest banks has differentially fallen since the passage of the Dodd-Frank Act - more than 3% relative to non-banks. The Bank x Top x Current coefficient is large in economic magnitude and highly significant across nearly all of the specifications. These results are stronger than the Top regressions for the CAPM which also feature negative coefficients but with magnitudes that are smaller and less significant. By capturing the changing loadings on the value and size factors during the financial crisis, the FF3 analysis indicates that the cost of capital for the largest banks has differentially fallen by as much as 3% since the passage of the Dodd-Frank Act.

5.5 Asset Betas

5.5.1 Distribution of Asset Betas

The analysis until now has focused on the mean of banks' cost of capital, which is driven by changes to equity betas, leverage, and the risk-free rate. However, it is also interesting to understand the distribution of the cost of capital. Greenwood et al. (2017) hypothesize that if banks are subject to multiple capital constraints that the industry will be pushed towards increasingly similar business models, particularly for the largest banks. We use beta as a simple metric to capture the similarity of business models. Since we do not want to capture in our analysis any effect from banks changing leverage similarly, we begin by delevering bank betas and focus our analysis on asset betas. Following Baker and Wurgler (2015), we approximate asset betas by multiplying equity betas by one minus leverage,

$$\beta_{i,t}^{Asset} \approx \beta_{i,t} \cdot (1 - L_{i,t}). \tag{6}$$

As in Section 5.6, we define leverage as total debt over total debt plus market equity (where total debt includes deposits for banks). The evolution of the distribution of asset betas for the 90 largest banks is shown in Figure 5. The interquartile range for bank asset betas has averaged approximately .08 over the last 20 years compared to a mean asset beta of .20 and a standard deviation of .04. While the distribution expanded during the Crisis and SCAP periods, it declined after the passage of DFA to be closer to .05. This initial decrease in the distribution of asset betas was consistent with the hypothesis in Greenwood et al. (2017), however was reversed in the last years in the sample when the distribution widened again.

We repeat the differences-in-differences analysis of equation 3 in Table 9 using the interquartile range as the dependent variable in the first four columns and the difference between the 95th and 5th percentiles in the last 4 columns. These regressions feature thirteen observations per month, one for each of the twelve Fama French industries with financials split into banks and non-bank financials. The first two columns look just at the largest 90 banks, while the second two look at all publicly traded banks. The Bank indicator coefficient shows that the asset beta distribution of banks is significantly less disperse than that of other industries on average. This difference reflects the elevated leverage of banks relative to non-financial firms, resulting in a lower level of asset betas and a more compressed distribution. After accounting for this difference, most of the time period dummies and interaction terms for banks are insignificant. The primary exception is during the GLB period. If anything, the results suggest that the deregulation of the 2000s was associated with a compression of asset beta distribution for banks relative to nonbanks. Over more recent periods, the interquartile range for bank asset betas is not statistically distinguishable from the pre-GLB period.

The last four columns report results for the tails of the distribution. If anything, these regressions suggest a widening of the distribution in recent years. However, given that only a few firms inform the q95 - q05 quantiles for the 90 largest banks, it is not surprising to see that most of the coefficients are insignificant, reflecting the significant amount of noise in estimating the tails of the distribution. For the larger sample that includes all banks in specification 8, the results indicate that the asset beta distribution may have actually widened out after the passage of DFA. Since the composition of our universe of banks has changed so much with the addition of firms such as broker dealers and credit card lenders, we also repeat the analysis limiting our sample of banks only to those firms that are depository institutions and have an SIC code beginning with 60. Results are similar (not shown).

5.5.2 Asset Betas over Time

For robustness, we also repeat the main analysis, using as a dependent variable asset beta instead of the equity betas that form the basis of the CAPM cost of capital estimates, focusing on the difference in difference specifications in Table 3 and looking specifically at the largest banks. This directly incorporates leverage into the estimated beta rather than including leverage as a linear control variable as in specification (5) of Table 3. Results are broadly similar (Table 11, first three specifications) – there is still a decrease in the asset beta after the financial crisis, although it is not always statistically significant. The difference in asset betas between the current period and the pre-GLB period is also less significant, and sometimes not statistically distinguishable from 0. That said, while there is a decrease from the SCAP period to the current period for Top banks, the Bank x Top x Current coefficient is positive and significant in these regressions whereas it is primarily negative and insignificant when using equity betas to compute the CAPM risk premium. Similar to the other Top regressions, the difference between the SCAP and current period is driven by the very largest banks, those differentially affected by post-financial crisis regulation.

5.6 Weighted average cost of capital

Bank managers often focus on the cost of equity capital which is compared to ROE. The advantage of this measure is that if banks are actively managing a net interest margin spread, their cost of debt may not be a relevant metric. However, since banks are so heavily financed with debt, an equity based measure may not capture their average financing cost (nor their marginal financing). Therefore, we explore another commonly used measure of the cost of capital, the weighted average cost of capital (WACC). This measure explicitly takes into account the after-tax cost of debt, the cost of equity, and the capital structure. However, it does not lend itself to an interpretation of changes in risk as easily as does an equity based cost of capital metric when the costs of debt adjust slowly.

We estimate the weighted average cost of capital from merged CRSP-Compustat data as,

$$WACC_{i,t} = Re_{i,t} \cdot \frac{ME_{i,t}}{D_{i,t} + ME_{i,t}} + Rd_{i,t} \cdot (1 - \tau_{i,t}) \cdot \frac{D_{i,t}}{D_{i,t} + ME_{i,t}} \tag{7}$$

where $Re_{i,t}$ is the cost of equity capital in the CAPM as estimated using the methods previously discussed, $Rd_{i,t}$ is interest expense over total debt, $\tau_{i,t}$ is the effective tax rate, $D_{i,t}$ is total debt, and $ME_{i,t}$ is market equity.[12] We winsorize the cost of debt $Rd_{i,t}$, the effective tax rate $\tau_{i,t}$, and market leverage $L_{i,t} = D_{i,t}/(D_{i,t} + ME_{i,t})$ at the 1% and 99% percentiles to mitigate the impact of outliers and measurement error. This data cleaning step is performed separately for financials and non-financials each month to allow for differences in firm characteristics and time trends, such as the high leverage of financial firms and the lower cost of debt and tax rates in recent years. When defining total debt for banks, we add to the Compustat total debt measure the total amount of deposits, in order to capture this important component of bank leverage which is not included in Compustat's total debt measure. This results in average leverage in the current period for banks of 0.81 and for nonbanks of 0.19 (see Table 1).

Table 2 reports the average WACC estimates net of the risk-free rate across time periods for banks and non-banks using the CAPM to estimate the cost of equity. Similar to the cost of equity, WACC-Rf increased the most for banks during the SCAP period and then declined to a level above its pre-GLB average. Value-weighted WACC-Rf increased by approximately 2% for banks and 0.7% for non-banks relative to the pre-GLB period. Comparing the SCAP to the current period, value-weighted WACC-Rf decreased by approximately 1% for banks versus an increase of 0.1% for non-banks. Figure 4 illustrates the increase in WACC for banks by plotting the value-weighted estimate using both the CAPM and FF3 models to compute the cost of equity. In Table 10, we repeat the difference-in-difference analysis, using WACC - Rf as the dependent variable. First, note that banks weighted average cost of capital is significantly lower than nonbanks on average. This reflects banks use of leverage and the lower cost of debt relative to equity financing. Like the other cost of capital measures, there is also a drop in WACC-Rf when comparing the post DFA period to the prior period (SCAP) that is statistically significant in several of the specifications. The results comparing the current time period to the pre-GLB period are similar to those of the other metrics with the exception of the equal-weighted results - the estimated WACC for banks is statistically significantly lower in specifications 5 and 6 which contrasts the increase in the equal-weighted CAPM and FF3 costs of equity.

[12]The cost of debt is a one-year moving average of quarterly interest expense over total debt which includes deposits and related liabilities for banks. The effective tax rate is a one-year moving median of quarterly income taxes over pre-tax income.

5.7 Robustness

5.7.1 Time-varying equity risk premium

What if the equity risk premium is time varying? In our analysis, we assume that CAPM holds and the market risk premium is constant. In this case, time variation in beta captures the change in cost of capital for banks relative to other firms. However, if the market risk premium is time varying, our analysis may be biased. Further, if the risk premium is correlated with bank betas, then declines in cost of capital may be underestimated. For example, if the equity risk premium in the current time period is lower than the equity risk premium in the previous time period and the current bank betas are lower than previous betas, the decline in the cost of capital will be underestimated.

We estimate a time-varying equity risk premium by projecting one-year ahead returns onto a one-factor partial least squares estimate that combines the estimates of the equity risk premium from 14 models that are described in Duarte and Rosa (2015) that have data available from 1965 to 2016.[13] The second three columns in Table 11 explore our baseline difference-in-differences regressions in the CAPM using the partial least squares estimate of the equity risk premium (denoted PLS-Rf). Almost all of the time period coefficients are larger than those in the specifications with a constant risk premium. This reflects the fact that our estimate of the time-varying equity risk premium has increased over the sample period, consistent with the findings in Duarte and Rosa (2015). For banks, the results are generally consistent with those from other specifications, in that the estimated cost of capital post-DFA is higher than pre-GLB but significantly lower than after the financial crisis. Specifications 4 and 5 indicate that the cost of capital for banks has declined by almost 10% from the SCAP period to the current period both in the cross section and within firm. Specification 6 shows that the results are again driven by the very largest banks. In comparison to the previous results, the larger magnitudes suggest that the assumption of a constant equity risk premium may be biasing our results down (equivalently, the results suggest that bank betas are positively correlated with the equity risk premium).

5.7.2 Controls for Interest Rates

An advantage of the differences in differences approach is that it controls for any business cycle effects that affect publicly traded companies in the same way, therefore alleviating any concerns that our regulatory time periods coincide with business cycles. However, if other factors correlated with the business cycle such as changes to interest rates affect banks

[13]Similar results hold by projecting one-year ahead returns onto the estimate of the equity risk premium from a dividend discount model, which is one of the 14 models included in the partial least squares estimate.

differently from other companies, this may bias our coefficients. Therefore, we add measures of interest rate levels and term spreads to our specifications in the final three columns of Table 11.

Looking within firm, the level of short rates is statistically significantly negatively associated with expected returns for both banks and nonbanks, with the coefficient for banks differentially more negative – expected returns for banks fall with short rates, even though we are subtracting out the risk-free rate from our measure of expected returns. That said, after we add these controls, our main results are similar. The cost of capital falls for banks after the financial crisis, and differentially so for large banks. The increase in expected returns from comparing the current period to the pre-GLB period is not as robust of a result – the difference between the current and pre-GLB periods is either insignificant or negative for banks or the largest banks. Beyond these results, we also estimate a three-factor model that includes a short term interest rate factor and a yield curve slope factor along with the market return, similar to Schuermann and Stiroh (2006).[14] The Appendix reports the results which are broadly similar to Table 11. Including the interest rate factors significantly lowers the cost of capital estimate for banks and for the largest banks in the current period relative to the other periods and in comparison to the other cost of capital estimates.

6 Conclusion

The cost of capital is important to managers because it represents the rate that they must earn on investor capital. It then is an input into managerial decisions such as lending quantities and pricing as well as decisions to allocate assets to different business lines. In this paper we rigorously estimate the cost of capital for the banking industry and explore how it has changed over time. Since the passage of the Dodd-Frank Act, the cost of capital for the banking industry has fallen dramatically, although to levels that still exceed pre-Graham-Leach-Bliley levels by approximately 1-2%. By some measures, the cost of capital for banks most affected by post financial crisis regulation has even fallen. Expected returns

[14] The interest rate factor model is $R^e_{i,t} = \alpha + \beta_m R_{m,t} + \beta_{short} R_{short,t} + \beta_{slope} R_{slope,t} + e_{i,t}$. As before, $R_{m,t}$ is the value-weighted CRSP excess return. To maintain similarity to our previous results, we compute tradeable interest rate factors $R_{short,t} = R_{2y,t} - rf_t$ and $R_{slope,t} = \frac{1}{5}(R_{10y,t} - rf_t) - (R_{2y,t} - rf_t)$ where $R_{2y,t}$ and $R_{10y,t}$ are the daily return from two-year and ten-year zero coupon bonds and rf_t is the daily risk-free rate. We compute zero coupon bond prices using the yield curve from Gurkaynak et al. (2006). The slope factor has zero duration by construction and is -99% (-74%) correlated with the change in the 10y-2y zero-coupon (constant maturity) slope at a daily frequency. Similarly, the short term factor is -99% (-92%) correlated with the change in the 2y zero-coupon (constant maturity) yield at a daily frequency. The corresponding cost of capital estimate is $E_t[R^e_{i,t}] = \beta^m_{i,t}\mu_m + \beta^{short}_{i,t}\mu_{short} + \beta^{slope}_{i,t}\mu_{slope}$ where $\mu_{short} = 1.14\%$ and $\mu_{slope} = -.41\%$ (the annualized excess return for the 10-year zero coupon bond is 3.67%).

for the very largest banks relative to smaller banks have fallen differentially by 1 to 3% relative to post-financial crisis levels depending on the metric. To the extent that expected returns are proxies for equity risk, this means that the risk of these firms has fallen as well, or at least returned closer to pre-deregulation levels after controlling for changes in asset mix.

It is worth noting the limitations of any analysis that seeks to understand the cost of capital. The true cost of capital measure relevant to bank managers is the expected returns of bank investors. One contribution of this paper is to present a preferred method for the calculation of expected returns and then explore how it has changed in the last two decades. But we do not have a time series of expected returns, only a model by which we estimate returns. Thus any test is a joint test of changes to expected returns and of the model through which expected returns are estimated. Some issues are alleviated by the differences in differences analysis (for example the risk-free rate is added to the expected returns and thus in differencing drops out). However, measures such as the equity risk premium are multiplied by our estimates of beta and thus do not simply drop out when differenced.

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Table 1: Summary Statistics for Cost of Capital Measures and Bank Variables

Panel A reports summary statistics for banks and non-banks in the CRSP-Compustat universe from March 1996 to December 2017. CAPM is the expected return from a single factor market model. CAPM-Rf is the expected return in excess of the one-month Treasury bill rate. FF3-Rf is the excess expected return from the Fama and French (1993) three-factor model. WACC-Rf is the excess weighted average cost of capital. Realized-Rf is the monthly excess realized return multiplied by 12. Bank regulatory variables are obtained from call reports and Y-9C filings. Panel B reports weighted averages over different time periods. The cost of capital is in annualized percentage units. Leverage is the ratio of total debt to total debt plus market equity, where we add deposits to total debt for banks.

Panel A Variable	p25	p50	p75	mean	sd	count
Nonbanks:						
CAPM	6.5	9.2	12.4	9.7	4.9	968868
CAPM - Rf	3.6	6.8	10.2	7.2	4.9	968868
FF3 - Rf	5.2	9.5	14.3	10.1	8.2	968868
WACC-Rf	2.8	5.3	7.9	5.6	3.8	521057
Realized - Rf	-85.4	2.2	92.4	16.7	228.8	968868
Banks:						
CAPM	3.3	6.3	9.5	6.8	4.5	142100
CAPM - Rf	0.8	2.9	7.6	4.4	4.5	142100
FF3 - Rf	1.9	6.5	12.1	7.3	6.8	142100
WACC-Rf	-1.1	0.5	1.3	0.2	1.8	128483
Realized - Rf	-40.4	6.2	58.0	11.5	120.9	142100
Leverage	0.83	0.87	0.91	0.86	0.09	135832
Tier 1 Capital Ratio	10.5	12.1	14.4	13.2	6.5	98635
Loan / Total Assets	60.3	68.2	75.0	66.2	13.7	101043
Asset Concentration (HHI)	17.4	21.9	26.8	23.1	9.0	100992
Trading Assets / Total Assets	0.0	0.0	0.0	0.5	2.9	101043
Deposits / Total Liab.	79.0	87.0	92.6	84.1	12.9	101043
RWA / Total Assets	65.0	72.8	80.0	72.1	12.2	98635
NPL / Total Loans	0.4	0.8	1.6	1.4	2.0	101002
Liquidity Coverage Ratio	58.2	65.7	71.7	63.6	15.8	101043
Panel B **Time Period**	**Basel 1**	**GLB**	**Crisis**	**SCAP**	**Current**	
Loan / Assets	60.4	52.5	51.0	42.7	46.6	
Trading Assets / Total Assets	5.8	7.7	9.5	11.5	8.9	
Asset Concentration (HHI)	13.0	13.3	13.6	13.2	13.3	
Tier 1 Capital Ratio	9.5	10.7	10.9	13.4	13.8	
Deposits / Total Liab.	70.3	59.4	57.8	52.6	63.4	
Liquidity Coverage Ratio	34.8	32.0	33.7	47.9	57.2	
RWA / Total Assets	79.0	74.1	72.0	67.3	66.4	
NPL / Total Loans	1.0	1.2	1.2	4.3	2.7	
Leverage - Banks and Nonbanks	0.25	0.26	0.26	0.28	0.25	
Leverage - Banks	0.80	0.77	0.81	0.85	0.81	
Leverage - Nonbanks	0.19	0.19	0.20	0.21	0.19	

Table 2: The Cost of Capital for Banks and Non-Banks Over Time

This table reports regressions of cost of capital measures onto a constant and time period dummies for banks and non-banks from March 1996 through December 2017. The dependent variables include the CAPM expected return, CAPM-Rf and FF3-Rf excess expected returns, WACC-Rf excess return, and realized excess return in annualized percent. Standard errors are clustered by firm and month with *, **, *** indicating significance at the 10%, 5%, and 1% levels respectively.

Cost of Capital Measure	Constant	GLB	Crisis	SCAP	Current	N
Banks, Equal Weighted						
CAPM	7.91***	-1.58***	-0.09	-1.43***	-1.70***	142100
	(0.12)	(0.27)	(0.39)	(0.31)	(0.24)	
CAPM-Rf	3.04***	0.24	2.33***	3.32***	2.98***	142100
	(0.15)	(0.21)	(0.25)	(0.33)	(0.24)	
FF3-Rf	8.89***	-3.75***	-0.24	-1.02**	-0.20	142100
	(0.33)	(0.34)	(0.53)	(0.48)	(0.42)	
WACC-Rf	-1.21***	1.02***	1.84***	3.18***	2.50***	128483
	(0.07)	(0.16)	(0.27)	(0.09)	(0.09)	
Realized-Rf	16.91**	-1.33	-47.16***	-4.81	1.83	142100
	(7.69)	(8.46)	(15.96)	(19.63)	(9.14)	
Banks, Value Weighted						
CAPM	13.59***	-3.15***	-0.60*	1.53*	-3.00***	142100
	(0.33)	(0.40)	(0.36)	(0.82)	(0.40)	
CAPM-Rf	8.71***	-1.14***	1.61***	6.28***	1.64***	142100
	(0.34)	(0.38)	(0.52)	(0.83)	(0.39)	
FF3-Rf	15.92***	-6.64***	-0.56	-0.25	-1.27*	142100
	(0.44)	(0.53)	(0.81)	(0.84)	(0.69)	
WACC-Rf	0.00	1.00***	1.68***	3.08***	2.24***	128483
	(0.15)	(0.31)	(0.46)	(0.41)	(0.33)	
Realized-Rf	19.17	-12.95	-60.63**	-3.02	-4.91	142100
	(11.96)	(13.13)	(24.30)	(23.92)	(13.76)	
Non-banks, Equal Weighted						
CAPM	10.24***	-0.35	0.02	-1.44***	-1.25***	968868
	(0.12)	(0.25)	(0.44)	(0.18)	(0.16)	
CAPM-Rf	5.37***	1.37***	2.38***	3.29***	3.41***	968868
	(0.13)	(0.21)	(0.18)	(0.19)	(0.15)	
FF3-Rf	11.28***	-1.38***	-2.39***	-1.08***	-1.57***	968868
	(0.19)	(0.23)	(0.23)	(0.22)	(0.20)	
WACC-Rf	3.69***	1.23***	2.83***	3.65***	3.65***	521057
	(0.09)	(0.20)	(0.12)	(0.15)	(0.11)	
Realized-Rf	12.20	10.50	-24.15	31.67	6.08	968868
	(10.46)	(13.86)	(20.42)	(22.66)	(11.93)	
Non-banks, Value Weighted						
CAPM	12.93***	-1.90***	-2.75***	-5.02***	-4.91***	968868
	(0.18)	(0.29)	(0.44)	(0.25)	(0.22)	
CAPM-Rf	8.06***	-0.12	-0.26	-0.28	-0.26	968868
	(0.17)	(0.20)	(0.23)	(0.25)	(0.22)	
FF3-Rf	6.97***	0.84**	0.25	0.76	0.42	968868
	(0.50)	(0.35)	(0.43)	(0.47)	(0.48)	
WACC-Rf	5.94***	-0.11	0.39	0.55*	0.68***	521057
	(0.21)	(0.24)	(0.26)	(0.29)	(0.26)	
Realized-Rf	16.82**	-15.87	-31.47**	1.83	-1.17	968868
	(8.20)	(10.08)	(15.56)	(16.42)	(9.20)	

Table 3: The Cost of Capital for Banks Compared to Other Industries

This table reports the differential cost of capital for banks over time relative to other industries by regressing the CAPM expected return in annualized percentage units onto a constant and time period dummies along with indicator and interaction terms for banks. Regressions are value-weighted by market capitalization or equal-weighted with some specifications including firm fixed effects. Specification (4) is restricted to banks and non-bank financials where financials are defined as firms with two-digit SIC codes between 60 and 69. The sample includes monthly observations for 11,959 companies in CRSP-Compustat from March 1996 to December 2017. Standard errors are clustered by firm and month with *, **, *** indicating significance at the 10%, 5%, and 1% levels respectively.

	(1) CAPM	(2) CAPM	(3) CAPM	(4) CAPM	(5) CAPM	(6) CAPM	(7) CAPM - Rf	(8) CAPM - Rf
GLB	-2.03***	-1.90***	-2.54***	-3.54***	-0.35	-0.75***	-0.83***	0.74***
	(0.27)	(0.29)	(0.27)	(0.52)	(0.25)	(0.23)	(0.20)	(0.20)
Crisis	-2.56***	-2.75***	-3.24***	-1.59***	0.02	-0.67	-0.85***	1.44***
	(0.41)	(0.44)	(0.44)	(0.44)	(0.44)	(0.45)	(0.25)	(0.19)
SCAP	-4.38***	-5.02***	-5.44***	-2.28***	-1.44***	-2.21***	-0.82***	2.23***
	(0.30)	(0.25)	(0.30)	(0.74)	(0.18)	(0.20)	(0.29)	(0.20)
Current	-4.75***	-4.91***	-5.54***	-4.52***	-1.25***	-2.20***	-0.98***	2.20***
	(0.21)	(0.22)	(0.26)	(0.47)	(0.16)	(0.17)	(0.25)	(0.16)
Bank		0.66*	-3.26***	-3.31***	-2.33***	-2.56***	-3.15***	-2.37***
		(0.37)	(0.47)	(0.53)	(0.18)	(0.53)	(0.46)	(0.54)
Bank x GLB		-1.25***	-0.78*	0.22	-1.24***	0.21	-0.58	0.33
		(0.45)	(0.41)	(0.60)	(0.21)	(0.23)	(0.40)	(0.24)
Bank x Crisis		2.15***	2.51***	0.86	-0.10	1.98***	2.25***	2.06***
		(0.60)	(0.65)	(0.59)	(0.30)	(0.33)	(0.65)	(0.33)
Bank x SCAP		6.55***	6.87***	3.69***	0.02	2.32***	6.88***	2.36***
		(0.88)	(0.96)	(1.05)	(0.33)	(0.34)	(0.95)	(0.34)
Bank x Current		1.91***	2.46***	1.43**	-0.45*	1.73***	2.45***	1.76***
		(0.46)	(0.55)	(0.65)	(0.25)	(0.27)	(0.53)	(0.27)
Observations	1110968	1110968	1110903	223273	1110968	1110903	1110903	1110903
Adjusted R^2	0.170	0.199	0.598	0.566	0.053	0.484	0.542	0.537
Fixed Effects	No	No	Yes	Yes	No	Yes	Yes	Yes
Weighting	VW	VW	VW	VW	EW	EW	VW	EW
Sample	All Firms	All Firms	All Firms	Banks+NBF	All Firms	All Firms	All Firms	All Firms

Table 4: The Cost of Capital for the Largest Banks

This table reports the differential cost of capital for the largest banks over time relative to large firms in other industries by interacting the binary variable *Top* with the time period dummies, the *Bank* indicator, and the *Bank* and time period interaction terms. *Top* is a binary variable equal to one when a firm is among the 20 largest firms as measured by assets within its Fama-French 12 industry. Regressions are either value-weighted by market capitalizaton or equal-weighted with some specifications including firm fixed effects. Standard errors are clustered by firm and month with *, **, *** indicating significance at the 10%, 5%, and 1% levels. The sample period is March 1996 to December 2017.

	(1) CAPM - Rf	(2) CAPM - Rf	(3) CAPM - Rf	(4) CAPM - Rf	(5) CAPM - Rf	(6) CAPM - Rf	(7) CAPM - Rf
GLB	-0.24	1.49***	0.60***	-0.26	0.73***	1.43***	0.81***
	(0.19)	(0.23)	(0.19)	(0.27)	(0.17)	(0.21)	(0.21)
Crisis	-0.10	0.94***	0.24	1.14***	0.76***	2.43***	1.49***
	(0.21)	(0.26)	(0.26)	(0.43)	(0.22)	(0.19)	(0.21)
SCAP	0.34	1.25***	0.50*	2.03***	1.36***	3.34***	2.25***
	(0.29)	(0.26)	(0.27)	(0.53)	(0.23)	(0.20)	(0.21)
Current	-0.10	1.22***	0.39*	0.69**	0.97***	3.53***	2.31***
	(0.21)	(0.22)	(0.23)	(0.35)	(0.21)	(0.16)	(0.17)
Bank	-0.92***	-1.20***	-3.00***	-3.28***	-2.47***	-2.50***	-1.88***
	(0.28)	(0.40)	(0.54)	(0.55)	(0.62)	(0.17)	(0.56)
Top	-1.46***	0.46	1.25***	1.04	1.70***	1.71***	1.09***
	(0.22)	(0.31)	(0.43)	(0.65)	(0.42)	(0.19)	(0.26)
Bank x Top	3.41***	3.17***	0.13	0.26	-0.46	5.19***	0.37
	(0.40)	(0.53)	(0.60)	(0.74)	(0.59)	(0.30)	(0.54)
Bank x GLB		-0.95*	-0.03	0.85**	-0.22	-1.08***	0.41*
		(0.50)	(0.36)	(0.38)	(0.33)	(0.22)	(0.24)
Bank x Crisis		1.85***	3.02***	2.15***	2.62***	-0.08	2.10***
		(0.65)	(0.53)	(0.56)	(0.50)	(0.30)	(0.34)
Bank x SCAP		3.02***	4.42***	2.93***	3.91***	-0.16	2.30***
		(0.65)	(0.64)	(0.75)	(0.57)	(0.32)	(0.34)
Bank x Current		1.71***	3.25***	3.02***	2.71***	-0.53**	1.82***
		(0.46)	(0.39)	(0.44)	(0.39)	(0.25)	(0.27)
Top x GLB		-2.50***	-2.12***	-2.72***	-2.30***	-1.46***	-1.17***
		(0.41)	(0.34)	(0.70)	(0.33)	(0.26)	(0.25)
Top x Crisis		-1.86***	-1.57***	-0.75	-1.91***	-1.38***	-0.85***
		(0.42)	(0.41)	(0.70)	(0.40)	(0.29)	(0.30)
Top x SCAP		-2.34***	-1.90***	2.07	-2.59***	-1.23***	-0.50
		(0.42)	(0.44)	(1.36)	(0.43)	(0.36)	(0.35)
Top x Current		-2.28***	-1.94***	-0.84	-2.35***	-2.26***	-1.48***
		(0.36)	(0.37)	(0.76)	(0.37)	(0.26)	(0.28)
Bank x Top x GLB		-0.48	-0.99*	-0.39	-0.66	-1.27***	-2.32***
		(0.71)	(0.55)	(0.84)	(0.54)	(0.38)	(0.39)
Bank x Top x Crisis		-0.49	-1.27*	-2.11**	-0.75	0.68	-0.86
		(0.78)	(0.70)	(0.85)	(0.61)	(0.60)	(0.62)
Bank x Top x SCAP		3.80***	2.78***	-1.27	3.26***	4.18***	2.01**
		(1.01)	(1.07)	(1.64)	(1.02)	(0.86)	(0.88)
Bank x Top x Current		-0.24	-1.24*	-2.45**	-0.78	0.26	-1.86***
		(0.66)	(0.63)	(0.95)	(0.66)	(0.50)	(0.52)
Leverage					0.03		
					(0.58)		
Observations	1110968	1110968	1110903	223273	890424	1110968	1110903
Adjusted R^2	0.055	0.092	0.551	0.599	0.561	0.111	0.538
Fixed Effects	No	No	Yes	Yes	Yes	No	Yes
Weighting	VW	VW	VW	VW	VW	EW	EW
Sample	All Firms	All Firms	All Firms	Banks+NBF	All Firms	All Firms	All Firms

Table 5: The Cost of Capital for Banks Controlling for Bank Characteristics

This table reports the differential cost of capital for banks over time relative to other industries controlling for bank characteristics. Regulatory variables are obtained from call reports and Y-9C filings. The time period dummies and bank indicator are omitted from the results for brevity. Regressions are value-weighted by market capitalization or equal-weighted with some specifications including firm fixed effects. Standard errrors are clustered by firm and month with *, **, *** indicating significance at the 10%, 5%, and 1% levels. The sample period is March 1996 to December 2017.

	(1) CAPM - Rf	(2) CAPM - Rf	(3) CAPM - Rf	(4) CAPM - Rf	(5) CAPM - Rf	(6) CAPM - Rf	(7) CAPM - Rf
Bank x GLB	-1.02**	-1.26***	-1.21***	-1.06**	-1.42***	-1.43***	-0.75*
	(0.44)	(0.39)	(0.40)	(0.42)	(0.39)	(0.38)	(0.38)
Bank x Crisis	1.87***	1.53**	1.58***	1.79***	1.40**	1.41**	2.04***
	(0.60)	(0.62)	(0.60)	(0.59)	(0.63)	(0.60)	(0.62)
Bank x SCAP	6.55***	5.87***	5.20***	6.39***	6.02***	5.12***	5.41***
	(0.87)	(0.90)	(0.87)	(0.87)	(0.88)	(0.84)	(0.88)
Bank x Current	1.90***	1.33***	0.93*	1.71***	1.80***	1.19**	1.64***
	(0.45)	(0.45)	(0.51)	(0.45)	(0.42)	(0.50)	(0.55)
Loan / Total Assets		-0.03***				-0.04***	0.02
		(0.01)				(0.01)	(0.01)
Trading Assets / Total Assets		0.02				-0.01	0.02
		(0.02)				(0.03)	(0.04)
Asset Concentration (HHI)		-0.05**				-0.03*	0.02
		(0.02)				(0.02)	(0.02)
RWA / Total Assets			-0.03**			0.02	0.04**
			(0.01)			(0.02)	(0.02)
NPL / Total Loans			0.31***			0.26**	0.37***
			(0.11)			(0.11)	(0.09)
Tier 1 Capital Ratio				0.01**		0.00	0.03***
				(0.01)		(0.00)	(0.01)
Deposits / Total Liab.					-0.04***	-0.02*	-0.04***
					(0.01)	(0.01)	(0.01)
Liquidity Coverage Ratio					-0.01***	-0.01***	0.03**
					(0.00)	(0.00)	(0.01)
Observations	1110968	1110968	1110968	1110968	1110968	1110968	1110903
Adjusted R^2	0.039	0.046	0.043	0.040	0.046	0.048	0.545
Fixed Effects	No	No	No	No	No	No	Yes
Weighting	VW	VW	VW	VW	VW	VW	VW
Sample	All Firms	All Firms	All Firms	All Firms	All Firms	All Firms	All Firms

Table 6: The Cost of Capital for the Largest Banks Controlling for Bank Characteristics

This table reports the differential cost of capital for banks and for the largest banks over time relative to other industries and to the largest firms in other industries controlling for bank characteristics. Results are reported for expected excess returns in the CAPM. Regressions are value-weighted by market capitalizaton or equal-weighted with some specifications including firm fixed effects. Standard errrors are clustered by firm and month with *, **, *** indicating significance at the 10%, 5%, and 1% levels. The sample period is March 1996 to December 2017.

	(1) CAPM - Rf	(2) CAPM - Rf	(3) CAPM - Rf	(4) CAPM - Rf	(5) CAPM - Rf	(6) CAPM - Rf	(7) CAPM - Rf	(8) CAPM - Rf
Bank x GLB	-1.18***	-0.34	-1.04**	-0.07	-1.49***	0.14	-1.15***	0.39
	(0.46)	(0.32)	(0.45)	(0.34)	(0.21)	(0.23)	(0.22)	(0.24)
Bank x Crisis	1.74***	2.54***	1.91***	3.00***	-0.66**	1.57***	-0.05	2.02***
	(0.58)	(0.49)	(0.60)	(0.52)	(0.29)	(0.32)	(0.31)	(0.34)
Bank x SCAP	2.56***	3.59***	3.05***	4.43***	-0.70**	1.71***	-0.19	2.24***
	(0.64)	(0.59)	(0.62)	(0.61)	(0.32)	(0.32)	(0.32)	(0.34)
Bank x Current	1.56***	2.70***	1.82***	3.18***	-0.92***	1.54***	-0.77***	1.79***
	(0.47)	(0.44)	(0.47)	(0.41)	(0.25)	(0.27)	(0.25)	(0.27)
Bank x Top	2.50***	0.37	2.66***	-0.03	2.66***	0.10	4.05***	0.29
	(0.57)	(0.58)	(0.53)	(0.60)	(0.56)	(0.53)	(0.44)	(0.55)
Bank x Top x GLB	-0.58	-0.85*	-0.61	-0.94*	-1.00**	-2.22***	-0.94**	-2.25***
	(0.69)	(0.50)	(0.66)	(0.52)	(0.44)	(0.39)	(0.39)	(0.39)
Bank x Top x Crisis	-0.79	-1.05*	-0.88	-1.28*	1.04	-0.49	0.71	-0.69
	(0.78)	(0.58)	(0.74)	(0.67)	(0.71)	(0.62)	(0.65)	(0.62)
Bank x Top x SCAP	2.63**	2.23**	3.14***	2.78**	3.91***	2.35***	3.75***	2.21**
	(1.01)	(0.91)	(1.06)	(1.07)	(0.99)	(0.87)	(0.96)	(0.89)
Bank x Top x Current	-1.09	-1.19**	-0.96	-1.12*	0.36	-1.33**	0.03	-1.67***
	(0.67)	(0.58)	(0.62)	(0.65)	(0.63)	(0.53)	(0.59)	(0.54)
Observations	1110968	1110903	1110968	1110903	1110968	1110903	1110968	1110903
Adjusted R^2	0.097	0.553	0.096	0.551	0.119	0.539	0.116	0.538
Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes
Reg Data Controls	Yes	Yes	Asset Mix	Asset Mix	Yes	Yes	Asset Mix	Asset Mix
Weighting	VW	VW	VW	VW	EW	EW	EW	EW
Sample	All Firms	All Firms	All Firms	All Firms	All Firms	All Firms	All Firms	All Firms

Table 7: The Impact of Stress Testing

This table reports the cost of capital for the largest 90 banks each month by assets with regulatory data from March 1996 to December 2017. The sample includes 227 banks in total and separates the current period dummy variable into $Dodd - Frank: \ Pre - CCAR$ from July 2010 through August 2013 and $Dodd - Frank: \ Post - CCAR$ from September 2013 through December 2017. $SCAP\ Firm$ is a binary variable equal to 1 for a bank that is subject to the initial round of stress testing. $CCAR\ Firm$ is a binary variable equal to 1 for a bank begins being subjected to stress testing in the later round of stress tests. Results are reported for expected excess returns in the CAPM and FF3 models. Regressions are value-weighted by market capitalizaton or equal-weighted with some specifications including firm fixed effects and control variables for bank characteristics. Standard errrors are clustered by firm and month with *, **, *** indicating significance at the 10%, 5%, and 1% levels. The sample period is March 1996 to December 2017.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	CAPM - Rf	CAPM - Rf	CAPM - Rf	CAPM - Rf	FF3 - Rf	FF3 - Rf	FF3 - Rf	FF3 - Rf
SCAP Firm x SCAP		1.83**	1.75**	1.94**		1.21	1.11	1.31
		(0.75)	(0.78)	(0.77)		(0.94)	(1.02)	(0.95)
SCAP Firm x DF: Pre-CCAR		-0.33	-0.59	-0.13		1.74*	1.25	1.46*
		(0.56)	(0.57)	(0.60)		(0.94)	(0.93)	(0.86)
SCAP Firm x DF: Post-CCAR		-1.24***	-1.64***	-1.14**		-1.25	-2.36***	-2.06***
		(0.46)	(0.48)	(0.53)		(0.77)	(0.78)	(0.76)
CCAR Firm x DF: Post-CCAR		-0.11	-0.53	0.16		-0.17	-0.99	-0.42
		(0.39)	(0.39)	(0.46)		(0.73)	(0.70)	(0.69)
GLB	0.53*	0.53*	0.25	-0.30	-4.81***	-4.81***	-4.76***	-4.89***
	(0.30)	(0.30)	(0.29)	(0.27)	(0.40)	(0.40)	(0.43)	(0.47)
Crisis	4.26***	4.25***	3.91***	2.77***	3.27***	3.27***	3.45***	2.82***
	(0.43)	(0.43)	(0.48)	(0.47)	(0.97)	(0.97)	(1.02)	(1.00)
SCAP	7.03***	6.69***	6.53***	5.09***	1.75**	1.55**	1.92**	0.77
	(0.61)	(0.61)	(0.62)	(0.61)	(0.73)	(0.76)	(0.81)	(0.89)
Dodd-Frank: Pre-CCAR	4.02***	4.06***	4.09***	2.89***	0.55	0.23	1.00	0.07
	(0.33)	(0.35)	(0.39)	(0.42)	(0.55)	(0.57)	(0.67)	(0.76)
Dodd-Frank: Post-CCAR	3.59***	3.81***	3.98***	3.03***	1.20**	1.45***	2.84***	2.34***
	(0.40)	(0.42)	(0.47)	(0.48)	(0.50)	(0.52)	(0.63)	(0.67)
SCAP Firm	1.03***	1.26***			-0.21	-0.29		
	(0.31)	(0.38)			(0.44)	(0.45)		
CCAR Firm	0.17	0.19			-0.51	-0.48		
	(0.41)	(0.45)			(0.59)	(0.53)		
Tier 1 Capital Ratio				0.01				0.01
				(0.03)				(0.04)
Observations	23205	23205	23205	23205	23205	23205	23205	23205
Adjusted R^2	0.371	0.376	0.580	0.608	0.323	0.327	0.503	0.518
Fixed Effects	No	No	Yes	Yes	No	No	Yes	Yes
Controls	No	No	No	Yes	No	No	No	Yes
Weighting	EW	EW	EW	EW	EW	EW	EW	EW

Table 8: Cost of Capital Estimates for Banks in the FF3 Model

This table reports the cost of capital for banks as measured by the Fama and French (1993) three-factor model relative to other industries and for top banks relative to other top firms from March 1996 to December 2017. Regressions are value-weighted by market capitalization or equal-weighted with some specifications including firm fixed effects. Standard errrors are clustered by firm and month with *, **, *** indicating significance at the 10%, 5%, and 1% levels.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	FF3 - Rf	FF3 - Rf	FF3 - Rf	FF3 - Rf	FF3 - Rf	FF3 - Rf	FF3 - Rf	FF3 - Rf	FF3 - Rf	FF3 - Rf	FF3 - Rf
GLB	0.18	0.84**	1.33***	-4.00***	-1.38***	-1.44***	0.34	0.78**	-2.41***	-1.49***	-1.58***
	(0.36)	(0.35)	(0.43)	(0.48)	(0.23)	(0.24)	(0.35)	(0.37)	(0.48)	(0.23)	(0.24)
Crisis	0.15	0.25	0.57	-1.31**	-2.39***	-2.38***	-0.94**	-0.62	-1.63**	-2.45***	-2.50***
	(0.41)	(0.43)	(0.49)	(0.64)	(0.23)	(0.24)	(0.38)	(0.41)	(0.65)	(0.24)	(0.25)
SCAP	0.71	0.76	1.39**	-1.22*	-1.08***	-1.24***	0.15	0.55	-1.25**	-1.11***	-1.35***
	(0.46)	(0.47)	(0.55)	(0.72)	(0.22)	(0.24)	(0.39)	(0.40)	(0.61)	(0.22)	(0.25)
Current	0.25	0.42	1.02*	-2.80***	-1.57***	-1.75***	-0.91**	-0.34	-2.55***	-1.60***	-1.85***
	(0.46)	(0.48)	(0.54)	(0.55)	(0.20)	(0.23)	(0.38)	(0.40)	(0.54)	(0.21)	(0.24)
Bank		8.95***	0.91	-2.09**	-2.39***	-3.56***	4.46***	-0.58	-2.36**	-2.79***	-3.40***
		(0.67)	(1.32)	(1.02)	(0.32)	(0.87)	(0.49)	(1.20)	(0.96)	(0.32)	(0.90)
Bank x GLB		-7.48***	-7.70***	-2.35***	-2.36***	-0.68*	-5.02***	-5.01***	-1.80***	-2.10***	-0.32
		(0.66)	(0.65)	(0.62)	(0.35)	(0.38)	(0.53)	(0.53)	(0.55)	(0.37)	(0.40)
Bank x Crisis		-0.80	-0.52	1.36*	2.15***	4.62***	0.97	2.03**	3.07***	2.20***	4.83***
		(0.95)	(0.98)	(0.74)	(0.53)	(0.57)	(0.84)	(0.93)	(0.96)	(0.54)	(0.58)
Bank x SCAP		-1.01	-0.60	1.91*	0.06	2.89***	-1.62**	-0.37	1.45*	0.04	3.06***
		(0.98)	(1.09)	(1.03)	(0.46)	(0.46)	(0.70)	(0.80)	(0.86)	(0.46)	(0.48)
Bank x Current		-1.70*	-1.17	2.57***	1.37***	3.85***	0.27	1.41**	3.63***	1.39***	4.09***
		(0.86)	(0.99)	(0.94)	(0.42)	(0.42)	(0.59)	(0.67)	(0.73)	(0.43)	(0.44)
Top							-4.29***	-1.47*	0.36	-2.27***	-1.97***
							(0.75)	(0.78)	(0.74)	(0.34)	(0.33)
Bank x Top							7.29***	2.53**	0.68	10.55***	3.69***
							(0.99)	(1.07)	(1.04)	(0.69)	(0.86)
Top x GLB							0.86	0.83	-2.82***	2.29***	2.38***
							(0.67)	(0.68)	(0.58)	(0.34)	(0.33)
Top x Crisis							1.93***	1.80**	1.33	1.66***	1.93***
							(0.71)	(0.71)	(0.93)	(0.36)	(0.35)
Top x SCAP							1.10	1.25	1.16	1.30***	1.87***
							(0.76)	(0.80)	(1.28)	(0.42)	(0.38)
Top x Current							2.17***	2.01**	0.17	1.22***	1.75***
							(0.75)	(0.79)	(0.90)	(0.37)	(0.34)
Bank x Top x GLB							-4.15***	-4.13***	-0.46	-6.18***	-7.53***
							(1.03)	(0.92)	(0.82)	(0.75)	(0.79)
Bank x Top x Crisis							-3.37***	-3.93***	-3.49***	-1.51	-3.47***
							(1.05)	(1.05)	(1.18)	(1.12)	(1.16)
Bank x Top x SCAP							-0.42	-0.95	-1.03	-0.62	-2.66**
							(1.27)	(1.34)	(1.67)	(1.12)	(1.17)
Bank x Top x Current							-3.71***	-3.98***	-2.25	-2.91***	-4.53***
							(1.28)	(1.33)	(1.37)	(0.95)	(0.99)
Observations	1110968	1110968	1110903	223273	1110968	1110903	1110968	1110903	223273	1110968	1110903
Adjusted R^2	0.001	0.099	0.491	0.520	0.026	0.352	0.156	0.494	0.534	0.030	0.352
Fixed Effects	No	No	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes
Weighting	VW	VW	VW	VW	EW	EW	VW	VW	VW	EW	EW
Sample	All Firms	All Firms	All Firms	Banks+NBF	All Firms	All Firms	All Firms	All Firms	Banks+NBF	All Firms	All Firms

Table 9: Distribution of Asset Betas

This table reports the distribution of asset betas by Fama-French 12 industry from March 1996 to December 2017. The dependent variable is either 75th-25th or 95th-5th percentile asset beta by industry. The percentiles are computed for both the entire sample (EW) and subset of the top 90 firms by industry (Top 90). Standard errors are clustered by industry and month with *, **, *** indicating significance at the 10%, 5%, and 1% levels.

	(1) q75-q25	(2) q75-q25	(3) q75-q25	(4) q75-q25	(5) q95-q05	(6) q95-q05	(7) q95-q05	(8) q95-q05
GLB	0.04**	0.04**	0.08***	0.09***	0.16***	0.17**	0.15***	0.16***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.05)	(0.06)	(0.04)	(0.05)
Crisis	0.01	0.02	0.09**	0.09*	0.07	0.08	0.17**	0.17*
	(0.05)	(0.05)	(0.04)	(0.04)	(0.11)	(0.12)	(0.07)	(0.08)
SCAP	0.02	0.02	0.08*	0.08*	0.10	0.09	0.17**	0.19*
	(0.05)	(0.06)	(0.04)	(0.04)	(0.13)	(0.14)	(0.08)	(0.09)
Current	-0.01	-0.01	0.04	0.04	0.02	0.01	0.09	0.09
	(0.05)	(0.05)	(0.03)	(0.03)	(0.10)	(0.10)	(0.06)	(0.07)
Bank		-0.31***		-0.39***		-0.73***		-0.96***
		(0.05)		(0.05)		(0.10)		(0.11)
Bank x GLB		-0.06***		-0.04**		-0.05		-0.13***
		(0.02)		(0.02)		(0.06)		(0.04)
Bank x Crisis		-0.03		-0.01		-0.11		-0.10
		(0.05)		(0.04)		(0.12)		(0.08)
Bank x SCAP		-0.05		-0.02		0.04		-0.17*
		(0.06)		(0.04)		(0.13)		(0.09)
Bank x Current		-0.02		0.03		0.23**		-0.05
		(0.05)		(0.03)		(0.10)		(0.07)
Observations	3393	3393	3393	3393	3393	3393	3393	3393
Adjusted R^2	0.010	0.242	0.020	0.276	0.025	0.219	0.013	0.359
IQR Type	Top 90	Top 90	EW	EW	Top 90	Top 90	EW	EW
Beta Type	Asset	Asset	Asset	Asset	Asset	Asset	Asset	Asset

Table 10: WACC Estimates for Banks

This table reports the cost of capital for banks as measured by the WACC relative to other industries and for top banks relative to other top firms from March 1996 to December 2017. Regressions are value-weighted by market capitalization or equal-weighted with some specifications including firm fixed effects. Standard errrors are clustered by firm and month with *, **, *** indicating significance at the 10%, 5%, and 1% levels.

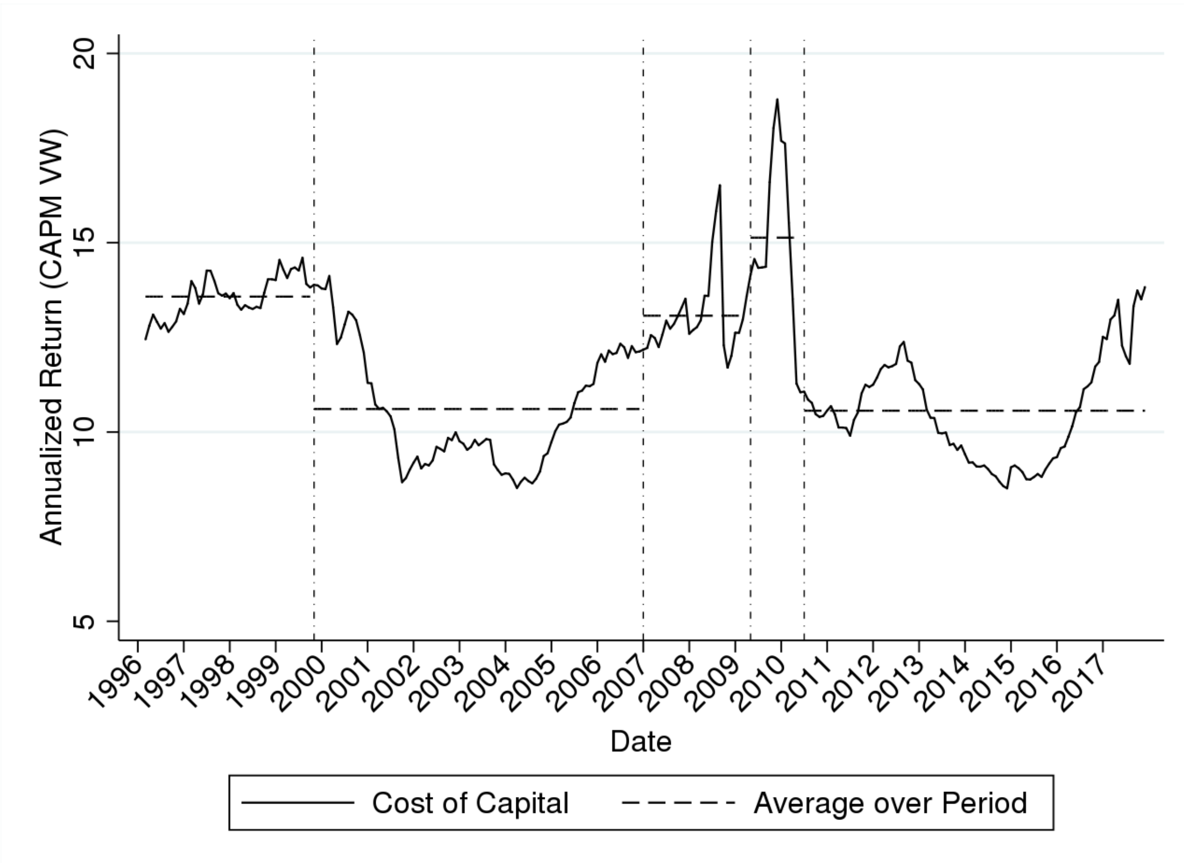
	(1) WACC-Rf	(2) WACC-Rf	(3) WACC-Rf	(4) WACC-Rf	(5) WACC-Rf	(6) WACC-Rf	(7) WACC-Rf	(8) WACC-Rf	(9) WACC-Rf	(10) WACC-Rf	(11) WACC-Rf
GLB	-0.02	-0.11	-0.63**	0.12	1.23***	0.77***	1.49***	0.77***	0.27	1.33***	0.91***
	(0.22)	(0.24)	(0.25)	(0.36)	(0.20)	(0.19)	(0.18)	(0.17)	(0.23)	(0.21)	(0.20)
Crisis	0.62**	0.39	-0.30	0.87**	2.83***	1.99***	1.93***	1.08***	0.75*	3.00***	2.18***
	(0.27)	(0.26)	(0.27)	(0.42)	(0.12)	(0.13)	(0.22)	(0.19)	(0.39)	(0.13)	(0.14)
SCAP	0.86***	0.55*	-0.21	2.06***	3.65***	2.79***	2.39***	1.60***	1.65***	3.83***	3.00***
	(0.29)	(0.29)	(0.29)	(0.49)	(0.15)	(0.17)	(0.22)	(0.21)	(0.43)	(0.16)	(0.18)
Current	0.93***	0.68***	-0.35	0.94**	3.65***	2.73***	2.30***	1.33***	0.64**	3.85***	2.99***
	(0.27)	(0.26)	(0.27)	(0.40)	(0.11)	(0.13)	(0.19)	(0.20)	(0.28)	(0.12)	(0.14)
Bank		-5.94***	-2.16***	-1.46***	-4.90***	-1.08**	-5.54***	-0.86*	-1.69***	-4.87***	-0.54
		(0.25)	(0.42)	(0.37)	(0.11)	(0.45)	(0.30)	(0.45)	(0.39)	(0.11)	(0.46)
Bank x GLB		1.11***	1.00***	0.25	-0.20	0.15	0.25	0.07	0.60**	-0.28	0.07
		(0.39)	(0.30)	(0.38)	(0.22)	(0.18)	(0.62)	(0.23)	(0.27)	(0.22)	(0.18)
Bank x Crisis		1.29**	1.33***	0.17	-0.99***	-0.17	0.54	0.56	0.93*	-1.14***	-0.29
		(0.53)	(0.41)	(0.44)	(0.32)	(0.32)	(1.08)	(0.44)	(0.50)	(0.33)	(0.33)
Bank x SCAP		2.54***	2.51***	0.24	-0.47***	0.32*	1.57	1.33***	1.34***	-0.65***	0.18
		(0.51)	(0.39)	(0.53)	(0.18)	(0.19)	(1.20)	(0.30)	(0.47)	(0.19)	(0.20)
Bank x Current		1.55***	1.66***	0.37	-1.15***	-0.36***	0.41	0.66***	1.41***	-1.36***	-0.53***
		(0.42)	(0.32)	(0.42)	(0.13)	(0.14)	(0.60)	(0.25)	(0.31)	(0.13)	(0.14)
Top							0.77**	1.48***	-0.82	1.05***	1.07***
							(0.34)	(0.38)	(0.57)	(0.18)	(0.22)
Bank x Top							-0.54	-1.67***	0.56	0.13	-1.14***
							(0.42)	(0.43)	(0.59)	(0.20)	(0.31)
Top x GLB							-2.27***	-1.91***	-0.21	-1.31***	-1.27***
							(0.35)	(0.35)	(0.54)	(0.19)	(0.19)
Top x Crisis							-2.22***	-1.86***	0.34	-1.81***	-1.63***
							(0.43)	(0.39)	(0.65)	(0.24)	(0.24)
Top x SCAP							-2.60***	-2.45***	1.58*	-1.88***	-1.70***
							(0.45)	(0.41)	(0.84)	(0.26)	(0.27)
Top x Current							-2.31***	-2.25***	1.08*	-1.93***	-1.96***
							(0.40)	(0.38)	(0.63)	(0.22)	(0.23)
Bank x Top x GLB							1.12	1.22***	-0.49	0.87***	0.43*
							(0.71)	(0.38)	(0.57)	(0.30)	(0.22)
Bank x Top x Crisis							1.13	1.06**	-1.17	1.65***	0.90***
							(1.14)	(0.49)	(0.72)	(0.42)	(0.28)
Bank x Top x SCAP							1.49	1.64***	-2.47***	2.04***	0.87**
							(1.30)	(0.51)	(0.90)	(0.57)	(0.37)
Bank x Top x Current							1.65**	1.36***	-2.04***	1.87***	0.67**
							(0.76)	(0.43)	(0.68)	(0.45)	(0.28)
Observations	649540	649540	649458	166382	649540	649458	649540	649458	166382	649540	649458
Adjusted R^2	0.018	0.230	0.666	0.848	0.389	0.693	0.267	0.673	0.852	0.392	0.695
Fixed Effects	No	No	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes
Weighting	VW	VW	VW	VW	EW	EW	VW	VW	VW	EW	EW
Sample	All Firms	All Firms	All Firms	Banks+NBF	All Firms	All Firms	All Firms	All Firms	Banks+NBF	All Firms	All Firms

Table 11: Time Varying Equity Risk Premium, Asset Beta, and Term Spread

This table reports asset betas from March 1996 to December 2017, the expected excess returns on CAPM with a time varying equity risk premium from March 1996 to December 2016, and the expected excess returns in the CAPM with a constant risk premium from March 1996 to December 2017. Asset beta is calculated by multiplying equity beta by ratio of equity to assets. The equity risk premium is estimated using the the projection of one-year ahead returns from 1965 to 2016 onto partial least squares estimate using 14 models from Duarte and Rosa (2015). T3M is the 3 month treasury yield. T10Y - T2Y is the difference between the 10 year and 2 year treasury yields. Regressions are value-weighted by market capitalizaton or equal-weighted with some specifications including firm fixed effects. Standard errrors are clustered by firm and month with *, **, *** indicating significance at the 10%, 5%, and 1% levels.

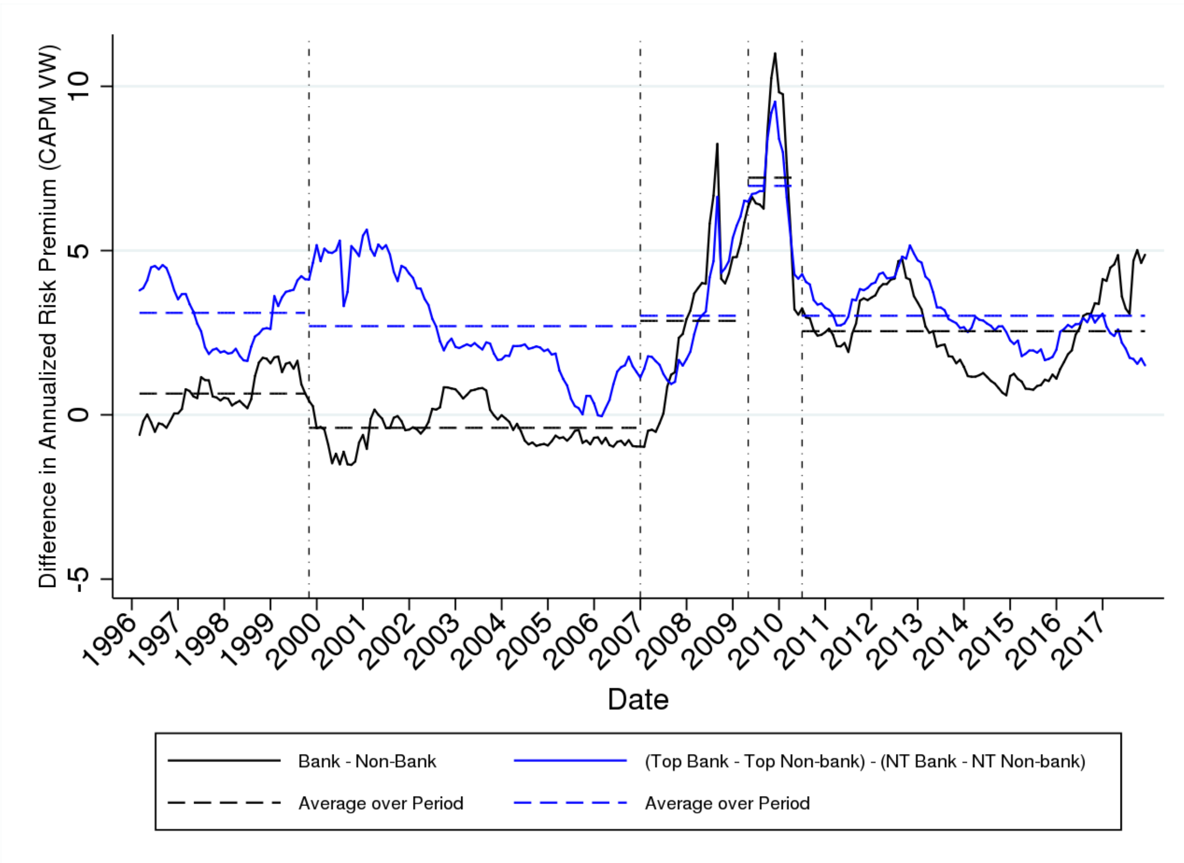
	(1) Asset Beta	(2) Asset Beta	(3) Asset Beta	(4) PLS-Rf	(5) PLS-Rf	(6) PLS-Rf	(7) CAPM-Rf	(8) CAPM-Rf	(9) CAPM-Rf
GLB	-0.03	-0.12***	0.05***	5.34***	5.13***	5.04***	-0.01	-0.99***	0.44**
	(0.03)	(0.03)	(0.02)	(0.67)	(0.63)	(0.70)	(0.24)	(0.23)	(0.21)
Crisis	-0.04	-0.13***	0.02	9.97***	9.08***	9.09***	-0.12	-1.08***	0.01
	(0.03)	(0.03)	(0.03)	(0.68)	(0.71)	(0.69)	(0.25)	(0.26)	(0.28)
SCAP	-0.06*	-0.16***	0.02	15.64***	14.77***	16.19***	0.03	-1.22***	0.09
	(0.03)	(0.03)	(0.03)	(0.62)	(0.64)	(0.57)	(0.31)	(0.31)	(0.30)
Current	-0.02	-0.16***	0.02	14.20***	13.12***	14.36***	-0.01	-1.44***	-0.08
	(0.03)	(0.03)	(0.02)	(0.43)	(0.46)	(0.44)	(0.30)	(0.28)	(0.27)
Bank	-0.58***	-0.11***	-0.02	-0.36*	-1.06	1.32	4.19***	-0.05	0.19
	(0.03)	(0.04)	(0.05)	(0.20)	(1.34)	(1.46)	(0.71)	(0.72)	(0.77)
Bank x GLB	0.04	0.06**	-0.06**	1.06***	1.38***	0.62	-1.99***	-1.30***	-0.75*
	(0.04)	(0.03)	(0.02)	(0.27)	(0.32)	(0.39)	(0.45)	(0.50)	(0.42)
Bank x Crisis	0.06	0.07*	0.02	3.02***	4.02***	2.03***	0.67	1.38**	2.13***
	(0.05)	(0.04)	(0.04)	(0.66)	(0.73)	(0.60)	(0.57)	(0.68)	(0.54)
Bank x SCAP	0.11*	0.14***	0.02	13.04***	14.02***	4.59***	4.36***	5.29***	2.86***
	(0.06)	(0.04)	(0.05)	(1.68)	(1.83)	(0.88)	(0.96)	(1.10)	(0.80)
Bank x Current	0.05	0.08**	-0.00	4.02***	5.34***	1.29**	-0.67	0.41	1.23**
	(0.05)	(0.03)	(0.03)	(0.70)	(0.89)	(0.51)	(0.57)	(0.70)	(0.58)
Top			0.14***			1.51***			1.23***
			(0.05)			(0.50)			(0.43)
Bank x Top			-0.13**			-3.78***			0.03
			(0.05)			(1.09)			(0.61)
Top x GLB			-0.24***			0.10			-2.13***
			(0.04)			(0.30)			(0.34)
Top x Crisis			-0.20***			-0.05			-1.59***
			(0.05)			(0.36)			(0.41)
Top x SCAP			-0.26***			-2.21***			-1.90***
			(0.05)			(0.57)			(0.44)
Top x Current			-0.24***			-1.91***			-1.95***
			(0.04)			(0.46)			(0.37)
Bank x Top x GLB			0.16***			1.43**			-0.98*
			(0.04)			(0.57)			(0.55)
Bank x Top x Crisis			0.07			2.99***			-1.22*
			(0.06)			(0.76)			(0.70)
Bank x Top x SCAP			0.17**			12.60***			2.77**
			(0.07)			(1.78)			(1.08)
Bank x Top x Current			0.11**			5.92***			-1.25*
			(0.05)			(1.14)			(0.65)
T3M							0.04	-0.12*	-0.12**
							(0.06)	(0.06)	(0.06)
T10Y - T2Y							-0.06	-0.07	-0.07
							(0.09)	(0.10)	(0.10)
Bank x T3M							-0.70***	-0.62***	-0.62***
							(0.12)	(0.14)	(0.13)
Bank x T10Y - T2Y							-0.49**	-0.56**	-0.57**
							(0.24)	(0.25)	(0.25)
Observations	890513	890424	890424	1072813	1072741	1072741	1110968	1110903	1110903
Adjusted R^2	0.141	0.666	0.673	0.579	0.671	0.675	0.041	0.545	0.554
Fixed Effects	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Weighting	VW	VW	VW	VW	VW	VW	VW	VW	VW
Sample	All Firms	All Firms	All Firms	All Firms	All Firms	All Firms	All Firms	All Firms	All Firms

Figure 1: The Cost of Capital for Banks



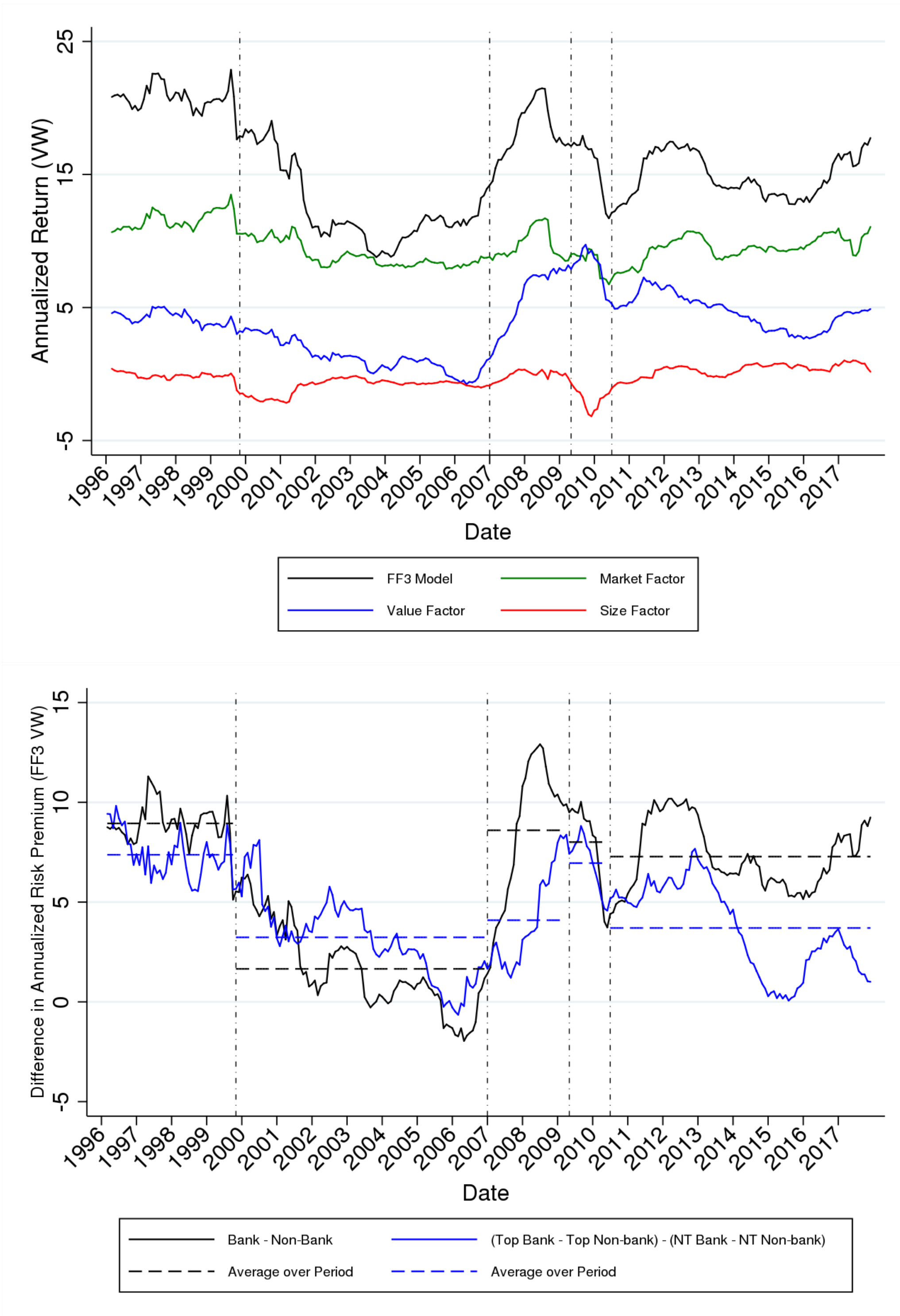
This figure plots the CAPM cost of capital for banks in the CRSP-Compustat universe value-weighted by market capitalization from March 1996 to December 2017. The cost of capital is estimated for each bank as $E_t[R_{i,t+1}] = R_{f,t} + \beta_{i,t} \cdot \mu$ where $R_{f,t}$ is the three-month Treasury bill rate, $\beta_{i,t}$ is a time-varying beta from rolling one-year regressions of daily firm level excess returns onto CRSP value-weighted excess returns, and $\mu = 8.2\%$ is the average annualized return for the CRSP value-weighted portfolio from 1975 to 2016.

Figure 2: The Cost of Capital for Banks Compared to Other Industries



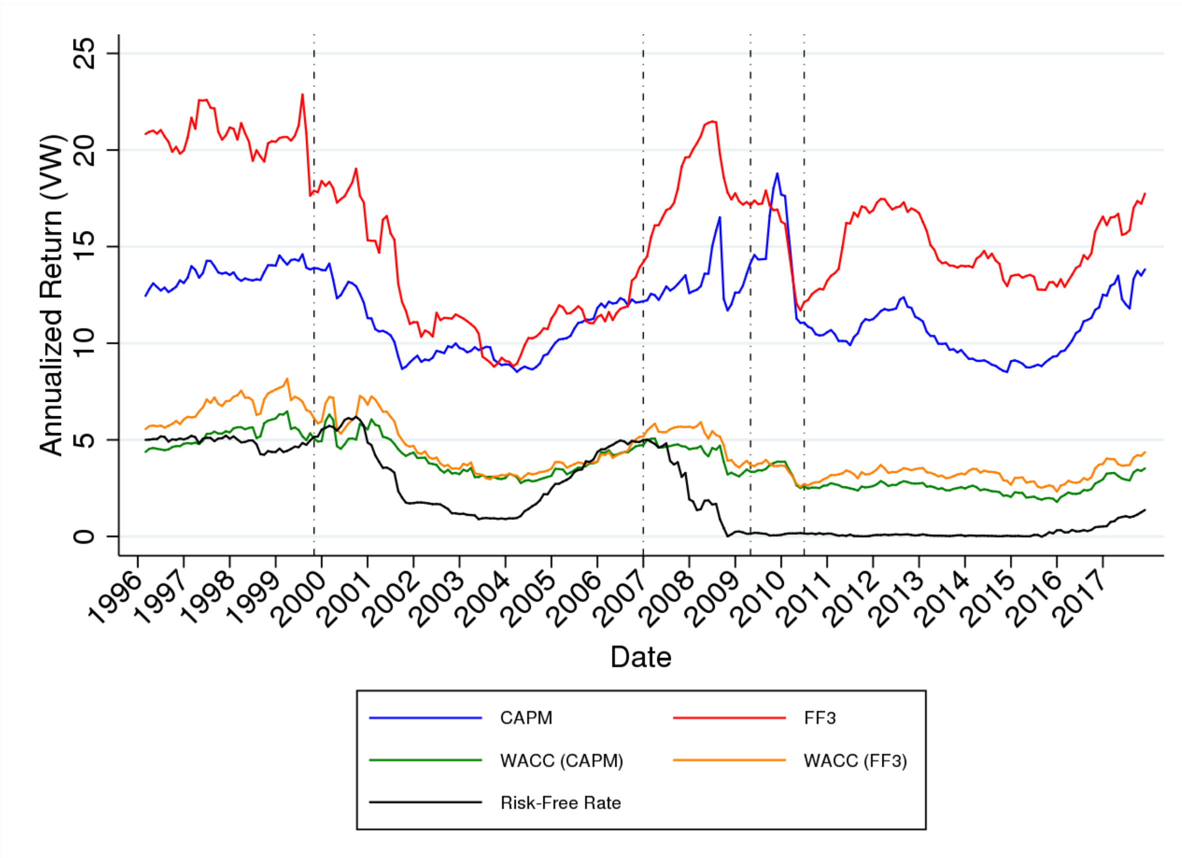
This figure plots the difference in the CAPM cost of capital estimate net of the risk-free rate for banks and top banks relative to other firms in the CRSP-Compustat universe value-weighted by market capitalization from March 1996 to December 2017. The dashed lines plot the average differences across subperiods.

Figure 3: The FF3 Cost of Capital for Banks



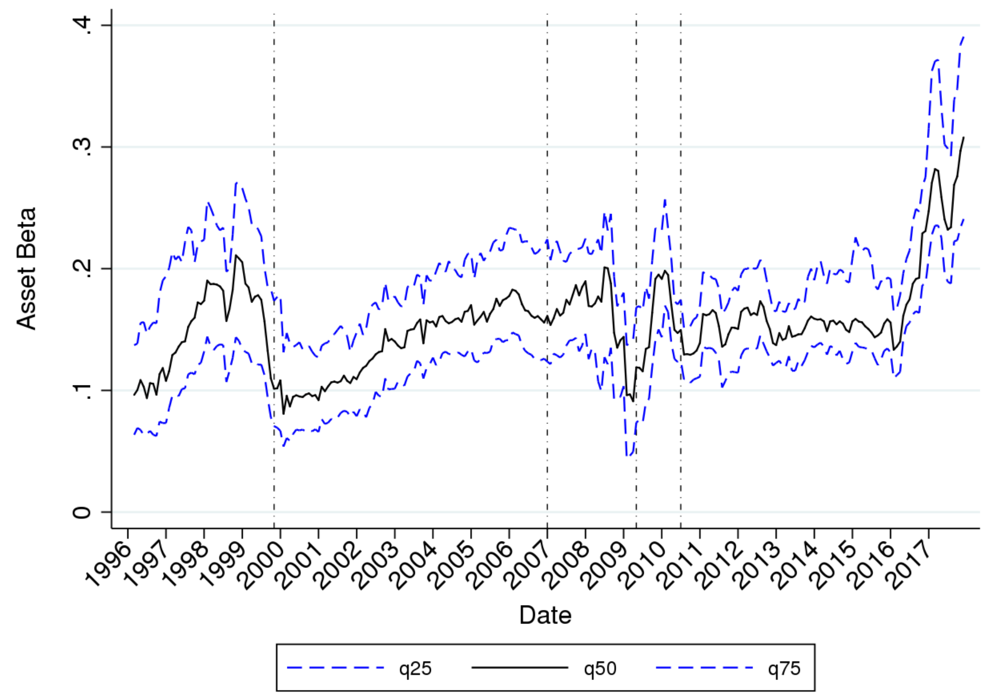
The top figure decomposes the value-weighted FF3 cost of capital into the contributions from the market factor, value factor, and size factor for banks in the CRSP-Compustat universe from March 1996 to December 2017. The bottom figure plots the difference in the FF3 cost of capital for banks and top banks relative to other firms. The dashed lines plot the average differences across the subperiods.

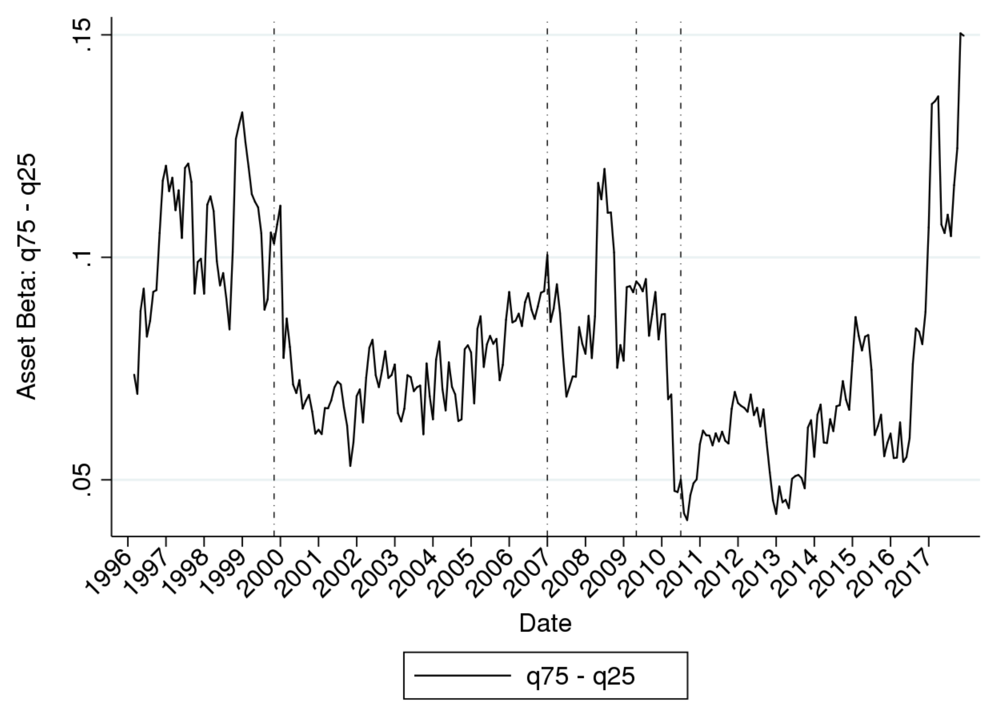
Figure 4: Different Estimates of the Cost of Capital for Banks



This figure plots the cost of capital and weighted average cost of capital (WACC) in the CAPM and FF3 models for banks in the CRSP-Compustat universe value-weighted by market capitalization from March 1996 to December 2017.

Figure 5: Distribution of Asset Betas for Large Banks





This figure plots the distribution of asset betas defined as $\beta_{i,t}^{Assets} = \beta_{i,t} \cdot (1 - L_{i,t})$ for the largest 90 banks by assets from March 1996 to December 2017.

A Appendix

A.1 Alternative definitions of regulatory breaks

In addition to varying our regulatory time periods by a few months, we experiment with different time series breaks. Because the SCAP was a one time stress test, rather than a regulatory change, we combine together the Crisis with the SCAP period. Comparing Table AA.1, specification (3) to Table 3 specification (7), our finding that the difference-in-difference for the current period between banks and non-banks is still economically and statistically significant at 199 basis points for the combined period, as compared to 209 basis points when comparing the current to the SCAP period.

A.2 Alternative bank sample

To the extent that we are interested in understanding changes to the market expected returns from banking assets, we considered other definitions of banks. We narrowing the sample to define as banks only those firms with SIC codes beginning with 60 (Depository Institutions). We drop from our sample entirely firms that were previously identified as banks but had SIC codes that did not begin with 60, since these firms are also subject to changes in regulation and thus do not belong in the comparison group. Results are generally similar to those presented in the paper, suggesting that changes to the cost of capital are not being driven solely by changes to the sample of regulated banks.

Appendix Table 1: Cost of Capital Estimates for Banks with Alternative Regulatory Breaks

This table reports the differential cost of capital for banks over time relative to other industries by regressing the CAPM expected return in annualized percentage units onto a constant and time period dummies along with indicator and interaction terms for banks. This table combines the Crisis and SCAP time periods to create one dummy for both periods. Regressions are value-weighted by market capitalization or equal-weighted with some specifications including firm fixed effects. Standard errrors are clustered by firm and month with *, **, *** indicating significance at the 10%, 5%, and 1% levels.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	CAPM - Rf	CAPM - Rf	CAPM - Rf	CAPM - Rf	CAPM - Rf	CAPM - Rf	CAPM - Rf	CAPM - Rf	CAPM - Rf	CAPM - Rf	CAPM - Rf
GLB	-0.22	-0.12	-0.83***	-1.79***	1.37***	0.74***	1.49***	0.60***	-0.33	1.43***	0.81***
	(0.18)	(0.20)	(0.20)	(0.44)	(0.21)	(0.20)	(0.23)	(0.19)	(0.27)	(0.21)	(0.21)
Crisis	0.06	-0.27	-0.84***	0.98**	2.67***	1.69***	1.04***	0.32	1.31***	2.72***	1.73***
	(0.23)	(0.23)	(0.26)	(0.46)	(0.18)	(0.18)	(0.25)	(0.25)	(0.44)	(0.18)	(0.19)
Current	-0.09	-0.26	-0.98***	-0.08	3.41***	2.18***	1.22***	0.38*	0.60*	3.53***	2.29***
	(0.20)	(0.22)	(0.25)	(0.43)	(0.15)	(0.16)	(0.22)	(0.23)	(0.35)	(0.16)	(0.17)
Bank		0.65*	-2.81***	-2.84***	-2.34***	-2.31***	-1.20***	-2.69***	-2.82***	-2.50***	-1.78***
		(0.37)	(0.42)	(0.46)	(0.18)	(0.54)	(0.40)	(0.50)	(0.50)	(0.17)	(0.56)
Bank x GLB		-1.02**	-0.59	0.38	-1.13***	0.33	-0.95*	-0.06	0.88**	-1.08***	0.40*
		(0.44)	(0.40)	(0.55)	(0.21)	(0.24)	(0.50)	(0.36)	(0.38)	(0.22)	(0.24)
Bank x Crisis		3.52***	3.81***	1.99***	-0.03	2.14***	2.19***	3.35***	2.38***	-0.11	2.15***
		(0.64)	(0.70)	(0.62)	(0.29)	(0.31)	(0.61)	(0.53)	(0.57)	(0.29)	(0.32)
Bank x Current		1.90***	2.32***	1.40**	-0.43*	1.75***	1.71***	3.16***	2.98***	-0.53**	1.81***
		(0.45)	(0.51)	(0.59)	(0.25)	(0.27)	(0.46)	(0.39)	(0.44)	(0.25)	(0.27)
Top							0.46	1.24***	1.25**	1.71***	1.10***
							(0.31)	(0.43)	(0.63)	(0.19)	(0.26)
Bank x Top							3.17***	0.21	0.17	5.19***	0.42
							(0.53)	(0.58)	(0.69)	(0.30)	(0.52)
Top x GLB							-2.50***	-2.13***	-2.72***	-1.46***	-1.17***
							(0.41)	(0.34)	(0.69)	(0.26)	(0.25)
Top x Crisis							-2.02***	-1.68***	-0.18	-1.31***	-0.71**
							(0.40)	(0.40)	(0.70)	(0.28)	(0.29)
Top x Current							-2.28***	-1.94***	-1.01	-2.26***	-1.48***
							(0.36)	(0.37)	(0.72)	(0.26)	(0.27)
Bank x Top x GLB							-0.48	-0.97*	-0.36	-1.27***	-2.33***
							(0.71)	(0.54)	(0.82)	(0.38)	(0.39)
Bank x Top x Crisis							1.18	0.33	-1.19	1.83***	0.04
							(0.82)	(0.78)	(0.86)	(0.62)	(0.60)
Bank x Top x Current							-0.24	-1.31**	-2.30***	0.26	-1.93***
							(0.66)	(0.61)	(0.88)	(0.50)	(0.51)
Observations	1110968	1110968	1110903	223273	1110968	1110903	1110968	1110903	223273	1110968	1110903
Adjusted R^2	0.001	0.033	0.536	0.536	0.103	0.536	0.086	0.545	0.557	0.110	0.537
Fixed Effects	No	No	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes
Weighting	VW	VW	VW	VW	EW	EW	VW	VW	VW	EW	EW
Sample	All Firms	All Firms	All Firms	Banks+NBF	All Firms	All Firms	All Firms	All Firms	Banks+NBF	All Firms	All Firms

Appendix Table 2: Cost of Capital Estimates for Banks with Alternative Bank Sample

This table reports the differential cost of capital for banks over time relative to other industries by regressing the CAPM expected return in annualized percentage units onto a constant and time period dummies along with indicator and interaction terms for banks. This table uses an alternative definition of banks defined as SIC code 60 firms and removing from the panel banks in the original sample that don't have SIC code 60. Regressions are value-weighted by market capitalization or equal-weighted with some specifications including firm fixed effects. Standard errrors are clustered by firm and month with *, **, *** indicating significance at the 10%, 5%, and 1% levels.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	CAPM - Rf	CAPM - Rf	CAPM - Rf	CAPM - Rf	CAPM - Rf	CAPM - Rf	CAPM - Rf	CAPM - Rf	CAPM - Rf	CAPM - Rf	CAPM - Rf
GLB	-0.24	-0.12	-0.83***	-1.75***	1.37***	0.74***	1.50***	0.61***	-0.20	1.43***	0.81***
	(0.18)	(0.20)	(0.20)	(0.47)	(0.21)	(0.20)	(0.23)	(0.20)	(0.27)	(0.21)	(0.21)
Crisis	-0.14	-0.26	-0.85***	0.61	2.37***	1.44***	0.94***	0.24	1.22***	2.43***	1.49***
	(0.21)	(0.23)	(0.26)	(0.46)	(0.18)	(0.19)	(0.26)	(0.26)	(0.45)	(0.19)	(0.21)
SCAP	0.18	-0.28	-0.81***	2.80***	3.29***	2.23***	1.28***	0.53**	2.53***	3.34***	2.26***
	(0.30)	(0.25)	(0.29)	(0.76)	(0.19)	(0.20)	(0.26)	(0.27)	(0.53)	(0.20)	(0.21)
Current	-0.16	-0.27	-0.98***	0.10	3.41***	2.20***	1.23***	0.40*	0.70**	3.53***	2.31***
	(0.21)	(0.22)	(0.25)	(0.46)	(0.15)	(0.16)	(0.22)	(0.23)	(0.35)	(0.16)	(0.17)
Bank		0.52	-3.14	-11.02***	-2.33***	-2.25***	-1.20***	-3.35*	-11.28***	-2.49***	-2.23***
		(0.37)	(2.07)	(1.69)	(0.17)	(0.81)	(0.40)	(1.90)	(1.51)	(0.17)	(0.82)
Bank x GLB		-1.36***	-0.49	0.43	-1.17***	0.32	-1.38***	-0.24	0.56	-1.10***	0.38
		(0.40)	(0.40)	(0.58)	(0.21)	(0.23)	(0.33)	(0.33)	(0.35)	(0.22)	(0.24)
Bank x Crisis		1.73***	2.56***	1.11**	-0.08	2.03***	1.24**	3.11***	2.13***	-0.08	2.06***
		(0.58)	(0.62)	(0.55)	(0.30)	(0.33)	(0.51)	(0.50)	(0.55)	(0.30)	(0.34)
Bank x SCAP		6.02***	6.85***	3.24***	-0.10	2.27***	1.66**	3.90***	1.89**	-0.16	2.24***
		(1.04)	(1.05)	(1.14)	(0.32)	(0.33)	(0.69)	(0.69)	(0.79)	(0.32)	(0.34)
Bank x Current		1.50***	2.67***	1.59**	-0.56**	1.73***	1.19***	3.25***	2.95***	-0.59**	1.75***
		(0.44)	(0.61)	(0.71)	(0.25)	(0.27)	(0.45)	(0.39)	(0.46)	(0.25)	(0.27)
Top							0.46	1.26***	1.03	1.71***	1.08***
							(0.31)	(0.44)	(0.73)	(0.19)	(0.26)
Bank x Top							3.02***	0.33	0.59	5.14***	0.75
							(0.53)	(0.64)	(0.86)	(0.30)	(0.60)
Top x GLB							-2.50***	-2.13***	-2.91***	-1.46***	-1.17***
							(0.41)	(0.34)	(0.73)	(0.26)	(0.25)
Top x Crisis							-1.86***	-1.58***	-0.97	-1.38***	-0.85***
							(0.42)	(0.41)	(0.74)	(0.29)	(0.31)
Top x SCAP							-2.37***	-1.93***	1.68	-1.23***	-0.49
							(0.42)	(0.45)	(1.41)	(0.36)	(0.35)
Top x Current							-2.29***	-1.95***	-0.58	-2.26***	-1.47***
							(0.36)	(0.37)	(0.85)	(0.26)	(0.28)
Bank x Top x GLB							-0.33	-0.64	0.15	-1.34***	-2.28***
							(0.62)	(0.55)	(0.84)	(0.39)	(0.40)
Bank x Top x Crisis							0.19	-1.01*	-1.61**	0.57	-0.78
							(0.69)	(0.59)	(0.80)	(0.61)	(0.64)
Bank x Top x SCAP							5.59***	3.86***	0.26	4.19***	2.38**
							(1.16)	(1.25)	(1.78)	(0.97)	(1.00)
Bank x Top x Current							0.08	-1.11	-2.49**	0.07	-1.59***
							(0.69)	(0.69)	(1.03)	(0.51)	(0.58)
Observations	1108369	1108369	1108304	220674	1108369	1108304	1108369	1108304	220674	1108369	1108304
Adjusted R^2	0.001	0.025	0.538	0.577	0.105	0.537	0.081	0.548	0.607	0.111	0.538
Fixed Effects	No	No	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes
Weighting	VW	VW	VW	VW	EW	EW	VW	VW	VW	EW	EW
Sample	All Firms	All Firms	All Firms	Banks+NBF	All Firms	All Firms	All Firms	All Firms	Banks+NBF	All Firms	All Firms

Appendix Table 3: Time Varying Bank Characteristics

This table reports the differential cost of capital for banks over time relative to other industries controlling for bank characteristics and time dummy bank characteristic interactions.

	(1) CAPM - Rf	(2) CAPM - Rf	(3) CAPM - Rf	(4) CAPM - Rf	(5) CAPM - Rf	(6) CAPM - Rf	(7) CAPM - Rf
Bank x GLB	-1.21***	-1.21**	-1.93***	-1.96***	-0.23	-1.35***	-0.97**
	(0.41)	(0.48)	(0.56)	(0.57)	(0.64)	(0.48)	(0.40)
Bank x Crisis	1.46**	1.26*	0.69	-0.18	2.43***	0.93	1.71***
	(0.61)	(0.66)	(0.72)	(0.91)	(0.84)	(0.74)	(0.64)
Bank x SCAP	6.41***	3.08**	6.08***	3.18***	2.58**	1.35	2.03**
	(0.89)	(1.27)	(1.02)	(1.12)	(1.05)	(1.08)	(1.02)
Bank x Current	1.76***	0.10	0.72	-1.26	3.63***	0.74	2.39**
	(0.45)	(0.92)	(0.60)	(1.03)	(1.17)	(1.06)	(1.02)
Loan / Total Assets		-0.01				-0.02	0.04
		(0.02)				(0.02)	(0.02)
Loan / Total Assets x GLB		-0.04***				-0.01	-0.03
		(0.01)				(0.03)	(0.03)
Loan / Total Assets x Crisis		-0.03*				-0.05*	-0.08***
		(0.02)				(0.02)	(0.02)
Loan / Total Assets x SCAP		0.04				-0.06*	-0.06**
		(0.03)				(0.03)	(0.02)
Loan / Total Assets x Current		-0.02				0.03	0.04
		(0.02)				(0.03)	(0.03)
Trading Assets / Total Assets		0.10***				0.00	0.11
		(0.03)				(0.04)	(0.07)
Trading Assets / Total Assets x GLB		-0.08**				0.00	-0.04
		(0.04)				(0.05)	(0.03)
Trading Assets / Total Assets x Crisis		-0.10***				-0.05	-0.13***
		(0.03)				(0.04)	(0.03)
Trading Assets / Total Assets x SCAP		-0.05				-0.06	-0.13*
		(0.06)				(0.05)	(0.07)
Trading Assets / Total Assets x Current		-0.08*				0.03	-0.06
		(0.04)				(0.05)	(0.07)
Asset Concentration (HHI)		-0.22***				-0.16***	-0.07**
		(0.06)				(0.03)	(0.03)
Asset Concentration (HHI) x GLB		0.19***				0.14***	0.12***
		(0.06)				(0.04)	(0.03)
Asset Concentration (HHI) x Crisis		0.18***				0.12***	0.08**
		(0.07)				(0.04)	(0.04)
Asset Concentration (HHI) x SCAP		0.12				0.13**	0.07
		(0.09)				(0.06)	(0.05)
Asset Concentration (HHI) x Current		0.22***				0.15***	0.07*
		(0.06)				(0.04)	(0.04)
Tier 1 Capital Ratio			-0.04			0.00	0.04***
			(0.04)			(0.01)	(0.01)
Tier 1 Capital Ratio x GLB			0.07			0.01	0.01
			(0.04)			(0.02)	(0.01)
Tier 1 Capital Ratio x Crisis			0.07*			-0.00	-0.02
			(0.04)			(0.01)	(0.01)
Tier 1 Capital Ratio x SCAP			0.03			-0.03	-0.05***
			(0.04)			(0.02)	(0.02)
Tier 1 Capital Ratio x Current			0.08*			0.01	-0.01
			(0.04)			(0.04)	(0.03)
Deposits / Total Liab.				-0.04***		-0.07***	-0.09***
				(0.01)		(0.02)	(0.02)
Deposits / Total Liab. x GLB				-0.00		0.04*	0.07***
				(0.01)		(0.02)	(0.01)
Deposits / Total Liab. x Crisis				0.01		0.09***	0.09***
				(0.02)		(0.02)	(0.02)
Deposits / Total Liab. x SCAP				0.05**		0.03	0.02
				(0.02)		(0.02)	(0.02)
Deposits / Total Liab. x Current				0.02		0.06***	0.03**
				(0.01)		(0.02)	(0.02)
Liquidity Coverage Ratio				-0.03***		-0.02***	0.03**
				(0.01)		(0.00)	(0.01)
Liquidity Coverage Ratio x GLB				0.02		0.01*	0.00
				(0.01)		(0.01)	(0.00)
Liquidity Coverage Ratio x Crisis				0.03*		0.03***	0.01
				(0.01)		(0.01)	(0.01)
Liquidity Coverage Ratio x SCAP				0.01		0.00	0.00
				(0.03)		(0.02)	(0.02)
Liquidity Coverage Ratio x Current				0.04**		0.04***	0.04***
				(0.02)		(0.01)	(0.02)
RWA / Total Assets					-0.01	0.07***	0.07***
					(0.02)	(0.02)	(0.03)
RWA / Total Assets x GLB					-0.03**	-0.06**	-0.05***
					(0.01)	(0.02)	(0.02)
RWA / Total Assets x Crisis					-0.06***	-0.11***	-0.08***
					(0.02)	(0.02)	(0.02)
RWA / Total Assets x SCAP					0.01	0.03	0.07*
					(0.02)	(0.04)	(0.03)
RWA / Total Assets x Current					-0.03*	-0.11***	-0.09***
					(0.02)	(0.03)	(0.03)
NPL / Total Loans					0.28	0.61*	0.47
					(0.61)	(0.32)	(0.32)
NPL / Total Loans x GLB					0.38	-0.31	-0.03
					(0.48)	(0.44)	(0.29)
NPL / Total Loans x Crisis					1.50**	1.46***	1.82***
					(0.73)	(0.47)	(0.39)
NPL / Total Loans x SCAP					0.34	0.15	0.19
					(0.61)	(0.37)	(0.37)
NPL / Total Loans x Current					-0.21	-0.56*	-0.27
					(0.62)	(0.34)	(0.32)
Observations	1110968	1110968	1110968	1110968	1110968	1110968	1110903
Adjusted R^2	0.040	0.048	0.042	0.047	0.047	0.054	0.556
Fixed Effects	No	No	No	No	No	No	Yes
Weighting	VW	VW	VW	VW	VW	VW	VW
Sample	All Firms	All Firms	All Firms	All Firms	All Firms	All Firms	All Firms
p-value	NA	0.001	0.019	0.000	0.000	0.000	0.000

Appendix Table 4: Cost of Capital Estimates for Banks in the Interest Rate Factor Model

This table reports the cost of capital for banks as measured by the interest rate factor model $R^e_{i,t} = \alpha + \beta_m R_{m,t} + \beta_{short} R_{short,t} + \beta_{slope} R_{slope,t} + e_{i,t}$ relative to other industries and for top banks relative to other top firms from March 1996 to December 2017. Regressions are value-weighted by market capitalization or equal-weighted with some specifications including firm fixed effects. Standard errors are clustered by firm and month with *, **, *** indicating significance at the 10%, 5%, and 1% levels.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	IR-Rf	IR-Rf	IR-Rf	IR-Rf	IR-Rf	IR-Rf	IR-Rf	IR-Rf	IR-Rf	IR-Rf	IR-Rf
GLB	-0.22	-0.24	-1.06***	-1.92***	1.38***	0.68**	1.48***	0.56**	-0.66*	1.45***	0.75***
	(0.21)	(0.24)	(0.24)	(0.51)	(0.29)	(0.28)	(0.28)	(0.25)	(0.34)	(0.30)	(0.29)
Crisis	-0.01	-0.17	-0.94***	0.27	3.01***	1.90***	1.50***	0.71**	0.88*	3.09***	1.99***
	(0.24)	(0.27)	(0.30)	(0.46)	(0.25)	(0.25)	(0.29)	(0.28)	(0.46)	(0.26)	(0.27)
SCAP	0.52	-0.13	-0.90***	2.44***	4.41***	3.08***	1.81***	0.97***	1.83**	4.49***	3.16***
	(0.34)	(0.29)	(0.33)	(0.93)	(0.23)	(0.24)	(0.29)	(0.30)	(0.76)	(0.24)	(0.25)
Current	-0.10	0.15	-0.82***	-1.51**	4.23***	2.83***	2.02***	1.10***	-0.33	4.35***	2.94***
	(0.25)	(0.27)	(0.30)	(0.64)	(0.23)	(0.23)	(0.28)	(0.28)	(0.51)	(0.24)	(0.25)
Bank		0.94**	-2.00**	-2.28**	-2.27***	-2.65***	-1.08**	-1.65*	-2.31**	-2.45***	-1.69**
		(0.44)	(1.00)	(0.93)	(0.22)	(0.93)	(0.47)	(0.93)	(0.94)	(0.21)	(0.85)
Bank x GLB		0.04	0.54	1.40**	-0.51**	1.08***	0.07	1.20**	2.42***	-0.48*	1.15***
		(0.46)	(0.45)	(0.60)	(0.26)	(0.27)	(0.50)	(0.46)	(0.51)	(0.26)	(0.27)
Bank x Crisis		1.85***	2.35***	1.13*	0.02	2.29***	2.30***	3.85***	3.68***	0.02	2.38***
		(0.67)	(0.75)	(0.63)	(0.39)	(0.41)	(0.72)	(0.61)	(0.62)	(0.39)	(0.42)
Bank x SCAP		6.67***	6.97***	3.62***	0.00	2.48***	3.44***	5.03***	4.18***	-0.16	2.45***
		(1.20)	(1.26)	(1.23)	(0.47)	(0.47)	(0.81)	(0.84)	(0.94)	(0.46)	(0.47)
Bank x Current		-2.83***	-2.32***	-1.63*	-2.71***	-0.51	-2.35***	-0.66	0.77	-2.65***	-0.27
		(0.60)	(0.71)	(0.83)	(0.28)	(0.33)	(0.72)	(0.70)	(0.75)	(0.27)	(0.33)
Top							1.14***	1.67***	1.39	2.49***	1.29***
							(0.38)	(0.51)	(0.91)	(0.25)	(0.31)
Bank x Top							3.49***	0.00	0.28	5.76***	1.19
							(0.63)	(0.78)	(0.86)	(0.40)	(0.86)
Top x GLB							-2.68***	-2.39***	-2.40***	-1.66***	-1.27***
							(0.48)	(0.43)	(0.90)	(0.31)	(0.29)
Top x Crisis							-2.60***	-2.40***	-0.99	-1.93***	-1.33***
							(0.48)	(0.48)	(0.79)	(0.34)	(0.36)
Top x SCAP							-3.00***	-2.70***	2.83	-2.01***	-1.14***
							(0.49)	(0.52)	(1.78)	(0.40)	(0.40)
Top x Current							-2.89***	-2.73***	-2.15*	-2.44***	-1.53***
							(0.48)	(0.47)	(1.20)	(0.34)	(0.35)
Bank x Top x GLB							-0.54	-1.20*	-1.19	-0.62	-1.95***
							(0.72)	(0.67)	(1.04)	(0.48)	(0.52)
Bank x Top x Crisis							-1.22	-2.19***	-3.61***	-0.31	-1.91***
							(0.80)	(0.77)	(0.85)	(0.63)	(0.66)
Bank x Top x SCAP							3.31***	2.16*	-3.39*	3.37***	1.07
							(1.17)	(1.30)	(2.04)	(1.09)	(1.14)
Bank x Top x Current							-1.24	-2.28**	-2.87*	-3.23***	-5.31***
							(0.88)	(0.91)	(1.52)	(0.63)	(0.69)
Observations	1110966	1110966	1110901	223273	1110966	1110901	1110966	1110901	223273	1110966	1110901
Adjusted R^2	0.001	0.026	0.361	0.413	0.078	0.359	0.058	0.371	0.436	0.083	0.360
Fixed Effects	No	No	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes
Weighting	VW	VW	VW	VW	EW	EW	VW	VW	VW	EW	EW
Sample	All Firms	All Firms	All Firms	Banks+NBF	All Firms	All Firms	All Firms	All Firms	Banks+NBF	All Firms	All Firms